INTERAVIA

REVIEW OF WORLD AVIATION

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IN THIS ISSUE

Zurich's Air Station

★

Paris Panorama

VOLUME VIII 8 1953

Western Europe

equips its aerodromes with

G.C.A.
THOMSON-HOUSTON

CFTH

Traffic control radar
Surveillance radar equipment
Precision approach radar
Civil and military installations

INTERAVIA

Review of World Aviation

Volume VIII | No 8 | 1953

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A. MUENCH, MONTREAL

Front cover:

Zurich's new air station, in use since April 9th, is to be officially inaugurated on August 29th.

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THIRD INTERNATIONAL TECHNICAL EXHIBITION

TURIN September 30th - October 11th 1953

International exhibition of technical progress, illustrating machinery, work, industrial and artistic accomplishment. All branches of mechanical engineering and metallurgy, aeronautical construction, agricultural machinery with practical demonstrations, plastics, cinematography.

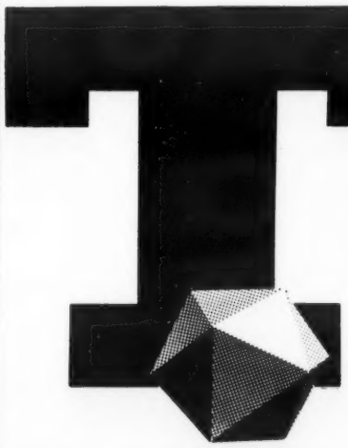
Programme of show

October 1st—2nd:	Fifth International Plastics Congress.
October 3rd—5th:	International Mechanical Agricultural Days with practical demonstrations at the National Mechanical Agriculture Centre.
October 4th—6th:	Fifth International Cinematographical Congress.
October 10th:	"Engineering Day".
October 9th—11th:	Fifth International Mechanical Production Congress.

October 3rd - 9th:

INTERNATIONAL FILM FESTIVAL

INTERNATIONAL PHOTOGRAPHIC EXHIBITION



Daily distribution of prizes

Come to TURIN!

Reduced rail fares

United Airgram

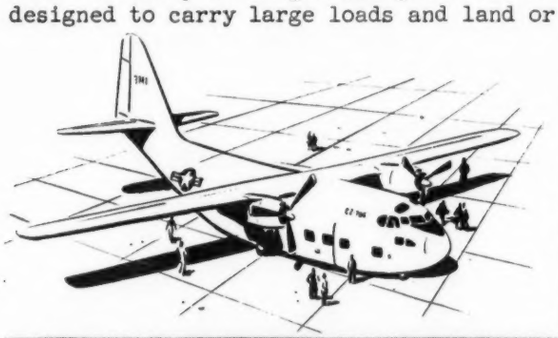
UNITED AIRCRAFT EXPORT CORPORATION

J-57 CHOSEN TO POWER F-100 AND OTHER AIRCRAFT

Pratt & Whitney Aircraft's powerful J-57 turbojet engine has been selected to power the single-engined North American F-100 fighter. Two other advanced Air Force fighter airplanes and an important Navy production aircraft are also scheduled to use the J-57 These production plans were announced in a recent letter from Frederick B. Rentschler, Chairman, and H. M. Horner, President, to stockholders of United Aircraft Corporation. Meanwhile Boeing Airplane Company has announced the selection of the J-57 for its new prototype jet transport. With J-57 production well under way, Pratt & Whitney Aircraft this year expects to produce, for the first time, more engine horsepower in turbojets than in piston engines. The J-48 is now in substantial production.

FIRST PRODUCTION C-123B DEMONSTRATED

The first production model of Chase Aircraft Company's C-123B "Flying Truck" was shown recently in flight and ground demonstrations. It is an assault transport, designed to carry large loads and land or take off from short, unprepared landing fields. The C-123B is powered by two Pratt & Whitney R-2800 piston engines, with Hamilton Standard Hydromatic propellers.



The aircraft can carry a maximum of 23,000 pounds in a variety of load combinations. It was demonstrated with 61 fully armed soldiers as one load, as well as with a 155 mm howitzer and 3/4-ton truck. As a hospital plane, it can carry 50 litter patients, plus 12 other persons.

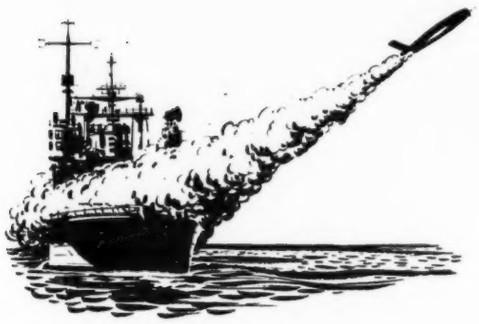
HAMILTON STANDARD TESTS TURBO-HYDROMATIC PROPELLER

Hamilton Standard's giant new Turbo-Hydromatic propellers are now undergoing engine tests. These three-bladed, single-rotation propellers are some of the widest and largest hollow steel-bladed propellers ever built. They will be used on the Lockheed R7V-2, a Navy transport version of the Super Constellation, and fitted to 5700 horsepower Pratt & Whitney Aircraft T-34 turboprop engines. Flight tests of the prototype aircraft, with the new propellers and engines, are expected this year.

Meanwhile Hamilton Standard has completed design work and has started building experimental supersonic propellers for turboprop engines of extremely high shaft horsepower. Aeronautical engineers recognize that propellers with gas turbine engines offer greatly increased aircraft performance over piston engines, and greater over-all economy than jet engines up to near-sonic speeds. This development program illustrates the Division's pioneering work in a field which offers great promise for future commercial and military aviation.

CHANCE VOUGHT GUIDED MISSILE IN PRODUCTION

The U.S. Navy has officially disclosed the Regulus, a new, plane-like guided missile. It is in production at Chance Vought Aircraft, Dallas, Texas. Regulus is a surface-to-surface missile, designed to be launched from submarines, ships, or shore bases. Development work began in 1947, and flight tests have been successfully conducted in secret since 1950.



No performance details of the missile have been released other than admission that test versions have flown many times at both sub-sonic and supersonic speeds. Regulus is described as about 30 feet long and resembling a conventional, swept-wing jet fighter aircraft. Test versions of the missile have special landing gear systems. After launching and guidance tests, these missiles can be flown back to base and landed. Substantial savings will result, since each missile can be flown many times for training instead of being expended on each test.

Navy officials disclosed that a modernized World War II submarine, the Tunny, has been modified as a launching platform for Regulus missiles. The Tunny has been fitted with a launching rack and a water-tight, tank-like "hangar" which enables it to submerge with the missile aboard.

COMMERCIAL HELICOPTER USE EXPANDS

One of the strongest movements in world-wide aviation is the rapidly-expanding commercial use of helicopters. In the United States, Canada, Great Britain, and several European countries, Sikorsky S-55 types are being used in a growing list of aviation duties.

Sikorsky S-55s are flying regular airmail and cargo schedules in several metropolitan areas of the United States. New stops are continually being added, and night flying is now common. A number of private business organizations have purchased S-55s, for flexible transportation of personnel or cargo, for aerial survey work or other unique uses. Rockwell Manufacturing Company of Pittsburgh is one of these firms. Its Sikorsky is used for rapid travel between offices in Pittsburgh, and factories in seven Pennsylvania and Ohio cities.

Several firms in Canada use S-55s. One is the Aluminum Company of Canada, Ltd., which is now constructing a vast hydro-electric and aluminum smelting project in the rugged Kitimat region of British Columbia. Sikorskys are used to airlift key personnel, survey parties and vital construction materials to remote or otherwise inaccessible areas of the project.

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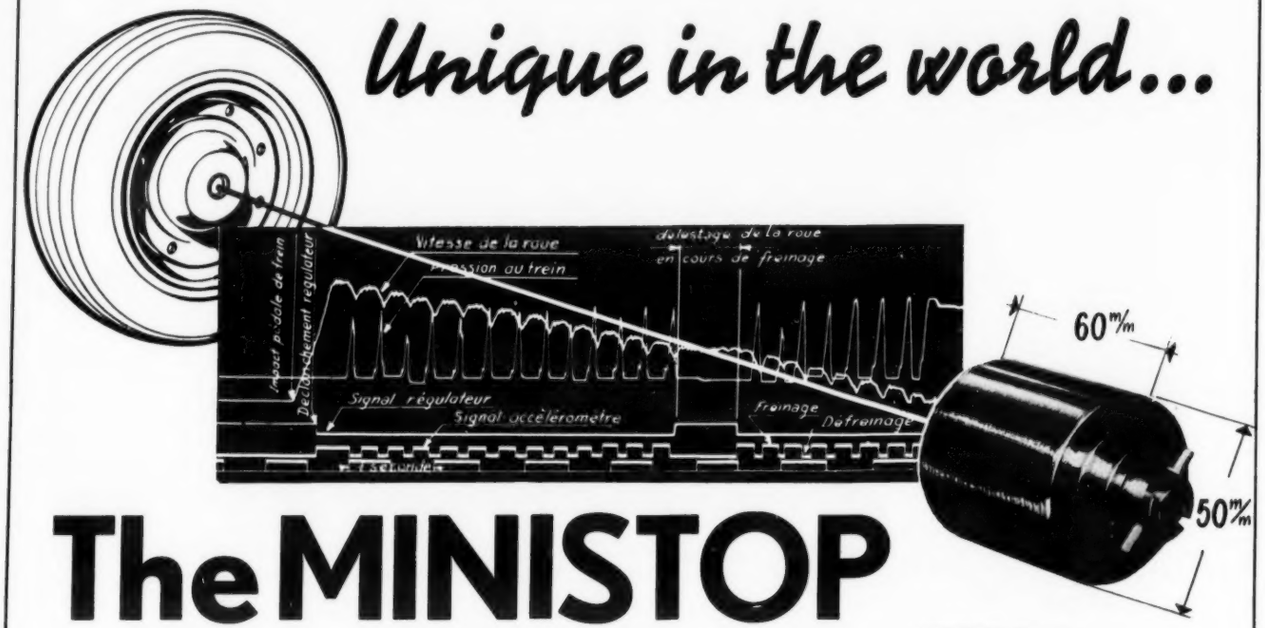
Unique in the world...



The MINISTOP

WEIGHT: ~~18~~ ozs.
11 ozs.

makes possible full use of brakes without skidding and enables:

(1) - brakes to be applied ***before*** landing,
(2) - load to be relieved on one wheel for any length of time,
(3) - engines to be run up on the ground,
(4) - brakes to be applied after take-off.

Simple, light in weight, small in bulk, it provides the ideal solution to the braking problem, especially for bicycle undercarriages.

Like the problem of landing, so the problem of braking is solved by...

MESSIER

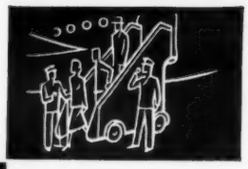
58, RUE FÉNELON - MONTROUGE (SEINE) TÉL. : ALÉ. 22-36

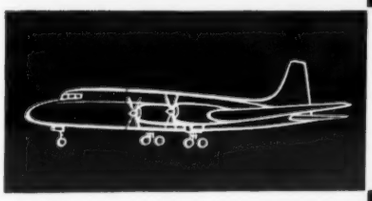
PEMA 6412

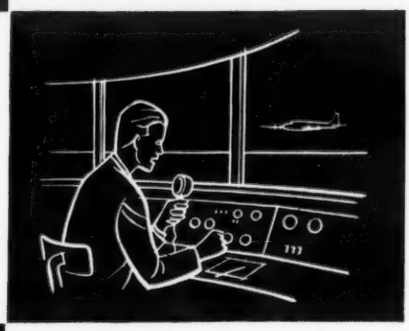
NATO HAS CHOSEN MYSTERE

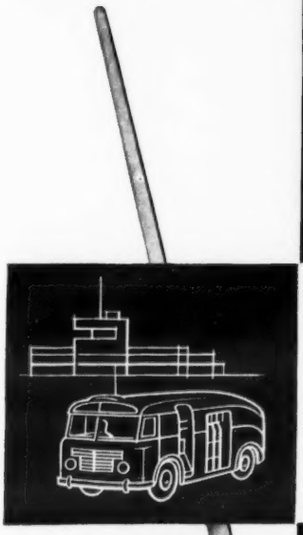
"WALKIEPHONE" PTC 122/123

PORTABLE RADIO-TELEPHONE FOR AIRFIELD COMMUNICATIONS







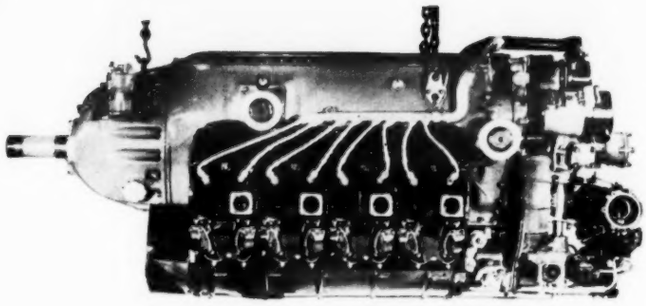


For purposes of routine inspection and maintenance the Pye V.H.F. Walkiephone makes a valuable but inexpensive addition to any V.H.F. Scheme. Armed with this lightweight equipment one man becomes, unimpeded, a source of information and when required, a centre of control. In places both unexpected and inaccessible the Pye "Walkiephone" ensures the smooth control of emergency operations. Robust, reliable, and economical in use, the complete equipment weighs only 10½ lb. with batteries.

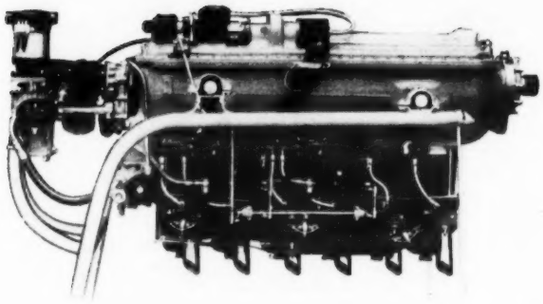
Telecommunications

PYE LIMITED · CAMBRIDGE · ENGLAND

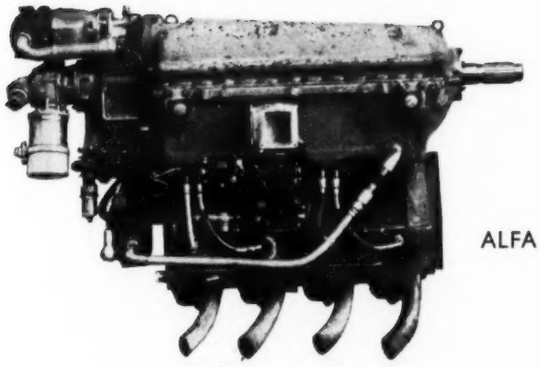
Alfa Romeo



ALFA 121 ENGINE



ALFA 115 TER ENGINE



ALFA 110 TER ENGINE

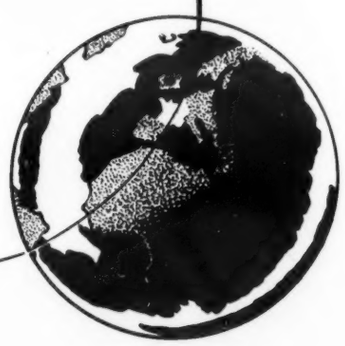
SNECMA

ATAR
TURBOJET

VULCAIN
TURBOJET

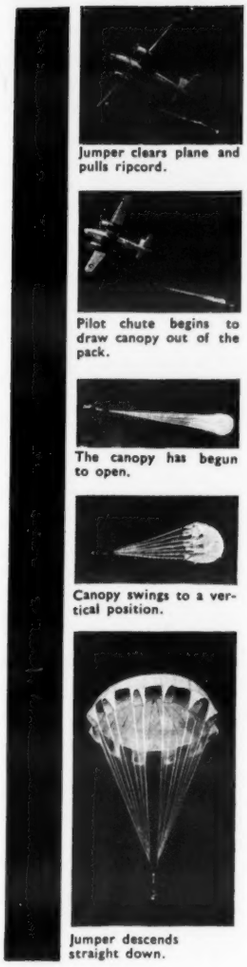
14 X
ENGINE

JET DEVIATOR



SOCIÉTÉ NATIONALE
D'ETUDE ET DE CONSTRUCTION DE MOTEURS D'AVIATION
150, Boul. Haussmann, PARIS-8e

less opening shock
less oscillation
less side drift
jumper descends straight down
landing on his feet



Jumper clears plane and pulls ripcord.

Pilot chute begins to draw canopy out of the pack.

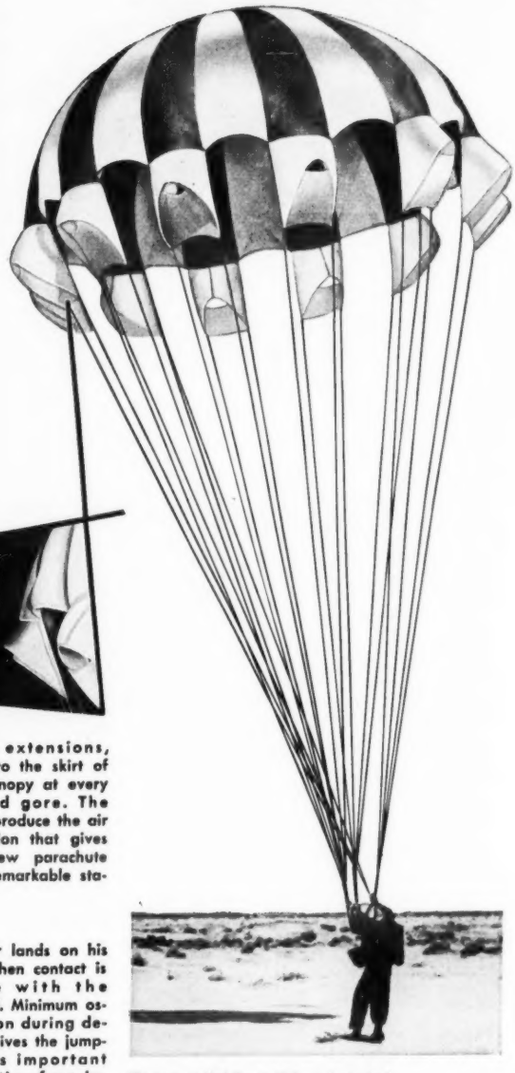
The canopy has begun to open.

Canopy swings to a vertical position.

Jumper descends straight down.

P7-B*
P9-B*

PIONEER Guide Surface Personnel Parachutes



Guide extensions, sewn to the skirt of the canopy at every second gore. The vents produce the air deflection that gives this new parachute such remarkable stability.

Jumper lands on his feet when contact is made with the ground. Minimum oscillation during descent gives the jumper this important protection from injuries.

Patents applied for in U.S. and principal countries throughout the world.

Once again, Pioneer Parachute Company's manufacturing facilities, as well as its development and engineering experience, work for the advancement of the aviation industry. The Pioneer P7-B* and P9-B* Guide Surface Personnel Parachute now makes more certain the saving of lives during emergencies at higher aircraft speeds — and safer than ever before in the history of aviation.

The Guide Surface Personnel Parachute is now standard equipment of the U. S. Air Forces and is available, through the Pioneer Parachute Company, to other governments and commercial flyers.

PARACHUTES MAKE THE DIFFERENCE!

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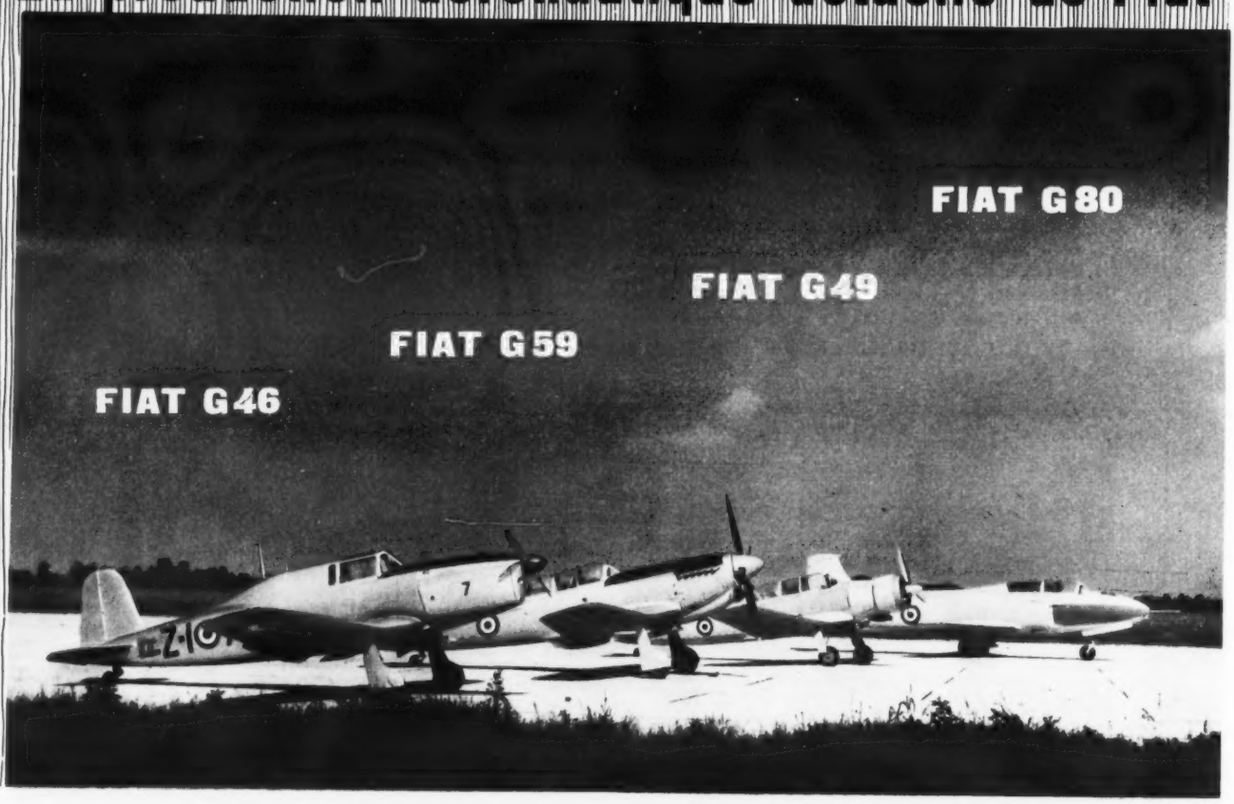
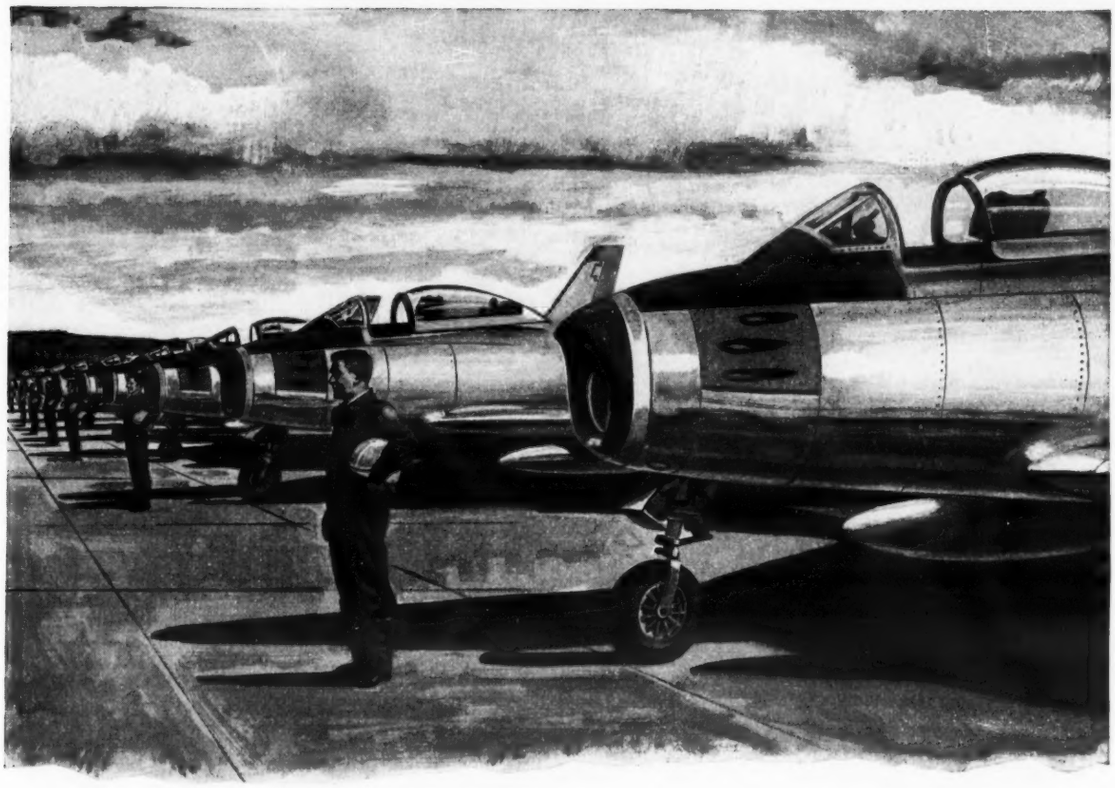
Une revue historique-technique de l'AVIAZIONE FIAT au Salon de l'Aéronautique

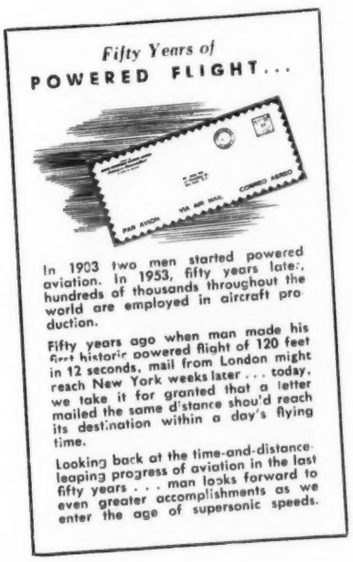
FIAT
48 PROTOTYPES DE MOTEURS
CONSTRUITS EN SÉRIE DEPUIS 1908
136 PROTOTYPES D'AVIONS
CONSTRUITS EN SÉRIE DEPUIS 1914
1953 DANS LA CONSTRUCTION ACTUELLE
LES AVIONS ET LES MOTEURS À REACTION

La production aéronautique actuelle de Fiat





"On Time" Deliveries COUNT — AT CANADAIR


Fifty Years of
POWERED FLIGHT...
In 1903 two men started powered aviation. In 1953, fifty years later, hundreds of thousands throughout the world are employed in aircraft production.
Fifty years ago when man made his first historic powered flight of 120 feet in 12 seconds, mail from London might reach New York weeks later . . . today, we take it for granted that a letter mailed the same distance should reach its destination within a day's flying time.
Looking back at the time-and-distance-leaping progress of aviation in the last fifty years . . . man looks forward to even greater accomplishments as we enter the age of supersonic speeds.

On time production of aircraft . . . the on time delivery to customers . . . that's what counts at Canadair . . . that's the international reputation Canadair has established.

Fulfilling the demands of this recognition . . . Canadair provides a team of highly efficient production men . . . supported by one of the world's best equipped plants . . . backed up by thousands of skilled Canadian workers.

You can count on Canadair . . . today or in the future . . . for commercial or defence production.

For further information: European Representative, J. H. Davis, Princes House, 190 Piccadilly, London, W.1., England.

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LIMITED, MONTREAL, CANADA

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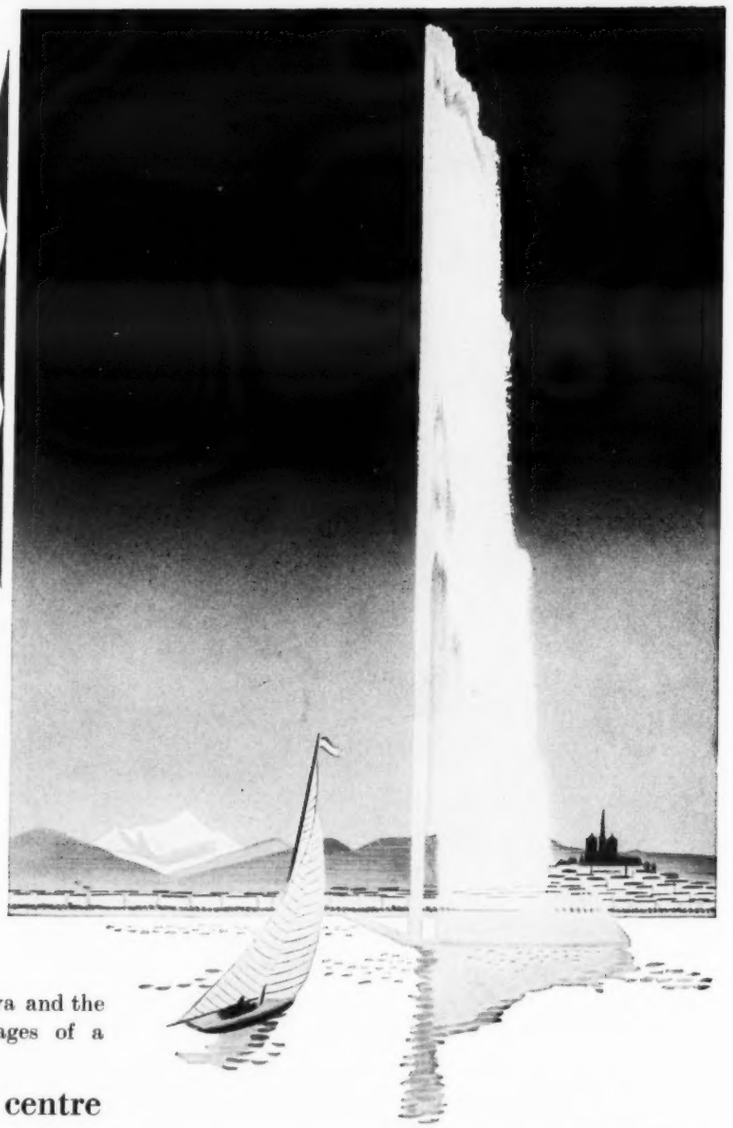
- *La Gruyère*
- *Château-d'Œx*
- *Villars*
- *Caux*
- *Montreux*
- *Vevey*
- *Lausanne-Ouchy*
- *St-Cergue s/Nyon*

- *Aix-les-Bains*
- *Annecy*
- *Megève*
- *Chamonix*
- *Evian*
- *Divonne-les-Bains*

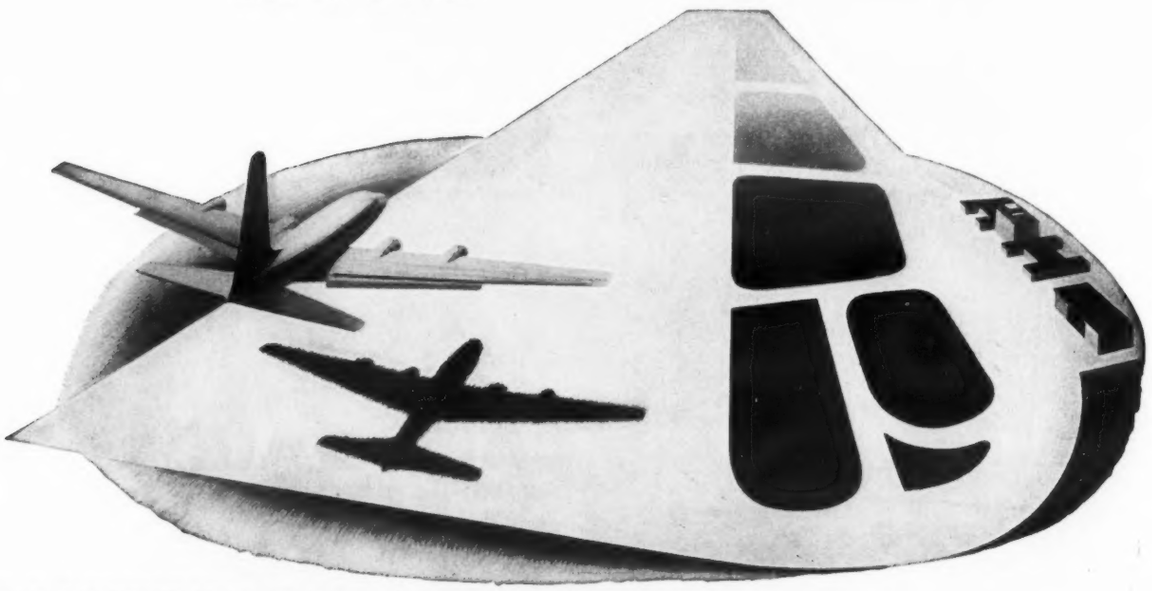


GENEVA

gateway to French Switzerland, Lake Geneva and the Mont Blanc district, offers all the advantages of a

tourist centre

with its lake, its parks, its summer university courses, its international meetings, events and institutions.



INTERCONTINENTAL AIRPORT

ZURICH INTERCONTINENTAL AIRPORT

Official opening August 29th/30th, 1953

View from Main Hall of new Terminal Building

HOMEBASE OF SWISS AIR LINES

Served by :

Air France
France

British European Airways (B.E.A.)
England

British Overseas
Airways Corporation (B.O.A.C.)
England

Israel National Airlines (EL-AL)
Israel

Koninklijke
Luchtvaart Maatschappij (K.L.M.)
Holland

Linee Aeree Italiane S.A. (L.A.I.)
Italy

Panair do Brasil
Brazil

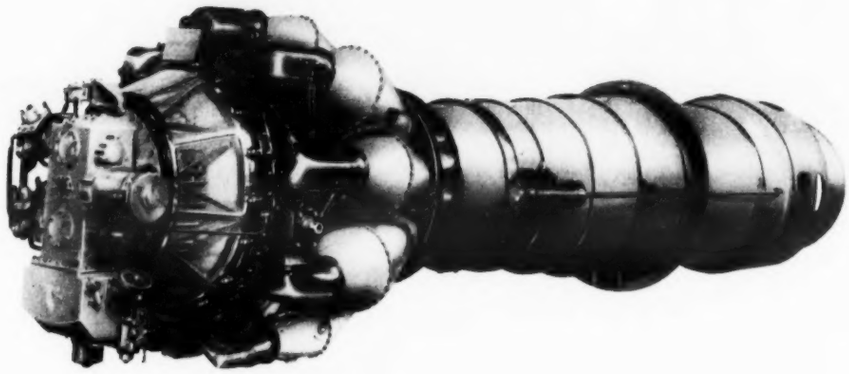
Philippine Air Lines (P.A.L.)
Philippines

S.A. Belge d'Exploitation de la
Navigation Aérienne (SABENA)
Belgium

Scandinavian Airlines System (S.A.S.)
Sweden, Norway, Denmark

Trans World Airlines (T.W.A.)
United States of America

Yugoslovenski Aero-Transport (J.A.T.)
Yugoslavia



«NENE» TURBOJET
with Hispano Suiza reheat

La Société d'Exploitation des Matériels

HISPANO SUIZA

3 turbojets built under « Rolls-Royce » licence

«NENE»

type 105 with double entry centrifugal compressor. Single-stage axial-flow gas turbine. Nine combustion chambers.

Diameter:	49.5 in.
Length:	96 in.
Weight:	1,610 lbs.
Revs.:	12,500 r.p.m.
Thrust:	5,180 lbs.

Fitted in France in the "MISTRAL" and MD 450 "OURAGAN" production aircraft and prototypes of the SO 30, SO 6021, SO 6025, SO 6026, SE 2410, SE 2415, Nord 2200, Bréguet 960-01 and Bréguet 960-02.

«TAY»

type 253 with centrifugal compressor and Hispano reheat, derived from the "Nene", with which it is interchangeable.

Diameter:	50 in.
Length:	99.6 in.
Weight:	1,870 lbs.
Revs.:	12,300 r.p.m.
Thrust:	6,280 lbs.
Thrust with reheat:	9,700 lbs.

The TAY type 250 (6,280 lbs. thrust) is fitted in the Marcel Dassault "MYSTÈRE II", three "MYSTÈRE III" prototypes and the "MYSTÈRE IV A" ordered in quantity.

«AVON»

type RA 7 with axial compressor and complete de-icing system

Diameter:	42.4 in.
Length:	119 in.
Weight:	2,346 lbs.
Revs.:	7,200 r.p.m.
Thrust:	7,500 lbs.
Thrust with reheat:	9,500 lbs.

To be fitted in France in the Dassault "MYSTÈRE IV B", HUREL-DUBOIS HD 45 and SE 210 "CARAVELLE". Fitted in Britain in the Hawker "HUNTER", Vickers "VALIANT", Supermarine "SWIFT" and 508, DH "COMET II", English Electric "CANBERRA", DH 110, Short SA 4 and, in Canada, the Avro "CANUCK".

Société d'Exploitation des Matériels

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In only 40 flying hours you can be half a world away

YOU TRAVEL FAST in the Douglas DC-6 and DC-6B. And on short trips or long, you ride in comfort high above the weather. These big, luxurious airliners are insulated against sound and vibration...air-conditioned ...pressurized...all for your relaxation. You arrive refreshed, and you save so much time by DC-6 or DC-6B.

"Queen of the Fleet" on these leading airlines of the world is the giant, modern Douglas DC-6 or DC-6B:

AA *Argentine* - ***ALITALIA** *Italian* - **AMERICAN** *U.S.*
BCPA *Australian-New Zealand* - **BRANIFF** *U.S.* - **CMA** *Mexican*
CONTINENTAL *U.S.* - **CPAL** *Canadian* - **DELTA-C&S** *U.S.*
***FLYING TIGER** *U.S.* - **JAL** *Japanese* - **KLM** *Netherlands* - **LAI** *Italian*
***LAN** *Chilean* - **NATIONAL** *U.S.* - ***NORTH AMERICAN** *U.S.* - **PAL** *Philippine*
PANAGRA *U.S.* - **PAN AMERICAN** *U.S.* - **SABENA** *Belgian*
SAS *Danish-Norwegian-Swedish* - **SLICK** *U.S.* - **SWISSAIR** *Swiss* - ***TAI** *French*
TRANSOCEAN *U.S.* - **UNITED** *U.S.* - **WESTERN** *U.S.* * *Soon*

Unmatched dependability, rain or shine! Douglas air transports fly more than two million miles *every day*! An extra margin of power enables the DC-6 to fly *around* weather disturbances and to maintain altitude with only two of its four engines. Reversible propellers land you against a cushion of air, make short or wet runways no problem.

Twice as many people fly **DOUGLAS** **as all other airplanes combined**

INTERAVIA

Deadline Notes

Nr. 8/1953

BLANK'S VISIT TO AMERICA

On his return from his trip to America West Germany's National Defence Commissioner Theodor Blank stressed that his talks with the American defence authorities had been of an exploratory nature only, and there was no question of any military agreement having been concluded. However, the principles of a future agreement had been settled in the broadest of outlines, namely: (1) the European Defence Community is the only possible basis for any German rearmament; (2) German contingent: 12 divisions; (3) basic cadres to be set up not later than the beginning of 1954; (4) forces to have American equipment, including approximately 1,300 jet fighters; (5) exchange of military missions to coordinate defence effort; (6) training of German instructors in the United States; (7) acceptance of American training principles by Germany; (8) observance by Germany of N.A.T.O. security regulations.

FUNERAL ORATION FOR THE BRABAZON

British Minister of Supply Duncan Sandys told the House of Commons on July 20th that the prototype of the Bristol 167 Brabazon 1 and its uncompleted sister aircraft the Brabazon 2, were to be scrapped. The Government had decided it would not be justified in authorizing any further expenditure on these aircraft. Development of the Brabazon - the 126-ton airliner for 72 passengers designed to the recommendations of the Brabazon Committee in 1942 - had cost roughly £12,000,000 = $33,600,000. Sandys said :" The Brabazon project had provided important scientific information, particularly on methods of reducing structural weight and overcoming stresses in large airframes, and also in connection with the development of more efficient power controls and electrical systems". The experience gained had been of particular assistance in the development of the Bristol Britannia four-engined turboprop airliner.

SABRE SETS UP WORLD SPEED RECORD

On July 16th, 1953, a North American F-86D Sabre of the U.S. Air Force, piloted by Lieut. Colonel William F. Barns, set up a new world speed record of 1,151.798 km/h near Thermal, Calif., (previous record 1,124.137 km/h set by Captain J. Slade Nash, U.S. Air Force, in 1952).

ROYAL AUSTRALIAN AIR FORCE BEATS MARTIN BY SHORT HEAD

While test flying in the English Electric Canberra twin-jet bomber being built under licence for the U.S.A.F. was beginning at The Glen L. Martin Co.'s works airfield in Baltimore ... the Royal Australian Air Force was already receiving the first Canberra built by Australia's Commonwealth Aircraft Corp. The aircraft is now being made ready to take part in the London-Christchurch race in September.

GROWING VOLUME OF U.S. AIR TRAVEL

The Air Transport Association of America announced on July 16th that revenue passenger-miles on America's scheduled domestic airlines during the months January to May 1953 had increased by 23.6%, compared with the equivalent period last year. On scheduled international services the corresponding increase had been 16.7%, on local services 22%.

ROUND THE WORLD FOR $ 1,200

In its application to the C.A.B. for renewal of its Pacific certificate, Trans World Airlines proposes minimum fares for round-the-world flights. It plans to charge $1,200 for a found trip via Tokyo - roughly $500 less than current first-class fares. Single fare on the North Atlantic - Europe Middle East - Tokyo service would be $821.

1 From INTERAVIA's world-wide news service, including INTERAVIA AIR LETTER, the daily international aviation news digest. — No part may be reproduced without written permission.

AIR FRANCE TRAFFIC VOLUME INCREASE

In its business report for 1952 Air France announces an increase of 21% in traffic volume, compared with the 1951 figure. Load factor on passenger services rose from 72% to 74%, turnover by 24.5% to 37,600,000,000 francs - net profit 110,000,000 francs (1951 : 52,000,000). The company stresses that these results were obtained before renewal of the fleet. Deliveries of the 10 Super Constellations, 12 Vickers Viscounts, 3 D.H. Comets and 12 Bréguet Deux Ponts ordered had not begun until the summer of 1953 and would not be complete before the end of 1954.

A.P.C. ORDER FOR FIRE CONTROL EQUIPMENT

Contraves Italiana, Rome, a subsidiary of the Bührle group's Contraves A.G., Zurich, has received an order from the United States Armament Procurement Center for electronic fire control equipment of the type described in Interavia Review No. 9, 1952. The equipment is for use with heavy anti-aircraft batteries (calibre 90 mm) and will be supplied to Italy as well as to other N.A.T.O. countries. Value of order: $10,000,000.

PROFESSOR VON KARMAN HONORARY DOCTOR OF AACHEN POLYTECHNIC

Professor Theodore von Karman - chairman of N.A.T.O.'s Advisory Group for Aeronautical Research and Development - has been awarded an honorary degree by Aachen Polytechnic Institute. Professor von Karman, who is an honorary doctor of seven universities in five different countries, held the chair of aerodynamics at Aachen up to the time of his emigration to the United States in 1929.

DOUGLAS PROFITS RISE BY 129%

Douglas Aircraft Co. reports a 129% increase in net profit for the first six months of the 1952-53 business year (December 1st, 1952 to May 31st, 1953), compared with the similar period of the previous year : from $4,383,680 ($3.65 per share) to $10,042,975 ($8.36 per share). Sales $458,778,680 ($196,119,150).

After approving the semi-annual report, the Board made the following changes in the company's management: 90-year-old William E. Douglas, father of founder Donald W. Douglas, withdraws from the company, and the Board is increased from 13 to 15 members. The three new members are : Donald W. Douglas Jr. (Vice-President in charge of Military Sales), Nat Paschall (Vice-President in charge of Commercial Sales), Stanley G. Welsh.

WORKSHOP BRIEFS ...

North American's F-100 Super Sabre supersonic fighter(45° wing sweep) made two flights on its first day of flight testing on June 1st, it was disclosed in mid-July. * Another new U.S. jet fighter is the F-105, now reported under construction by Republic Aviation Corp. * Lockheed reports a speed-up in production of the F-94C Starfire all-weather fighter. * Glenn L. Martin's first licence-built English Electric Canberra (B-57A) intruder-bomber accomplished its maiden flight on July 20th. * The huge Convair XP5Y four-engined turboprop flying-boat, predecessor of the R3Y-1 naval transport, crashed into the sea July 15th. The crew had bailed out. The aircraft had been flying since April 8th, 1950. * The large Sikorsky S-58 helicopter is to go into production for the U.S. Army. * Vickers-Supermarine hope to have a swept-wing, conventional-tail version of the Type 508 twin-engined fighter at Farnborough in September. * Cruising speed of the Handley Page H.P.80 Victor scimitar-wing four-engined bomber is said to be just under Mach 1. * Fairey Aviation have won the British Ministry of Supply contract for the development of a 40-50 passenger "rotor-coach" for BEA's short-range services. Called "Rotodyne", it will have two Napier Eland turboprops and tip-driven jet rotors. * The de Havilland Gyron axial compressor jet engine is said to have exceeded its design thrust of 15,000 lbs. Design details are secret. * The airframe of the Sud-Ouest SO 4050 Vautour all-weather fighter/bomber is designed for much higher thrusts than that furnished by the SNECMA Atar 101's now fitted. * The second prototype of the SIPA S.200 Minijet ultra-light two-seater trainer had accomplished about 35 flights by mid-July. * Svenska Aeroplan A.B. has fitted two boundary layer fences to the SAAB-32 Lansen two-seat ground attack aircraft. * Jugoslavia's first swept-wing prototype, a "combined fighter and communications aircraft", made its first flight last month. * The first Japanese-built Fletcher FD-25B unarmed two-seater trainer has started its flight tests. Builders are the Toyo Aircraft Co.

Paris Panorama

Superficially, there was little difference between the scenes at Juvisy airfield in 1909 and at Le Bourget airport in 1953, except that the fashions had changed somewhat. Hats, starched collars and flowing skirts have given way to more informal clothes. The classical *apéritif* has been replaced by Coca Cola, and the term "hot dogs" has become part of the French language.

Maurice Heurteux, Managing Director of Hispano-Suiza and President of the 20th Paris International Aviation Salon, Georges Héreil, Managing Director of SNCA du Sud-Est, Georges Glasser, Managing Director of SNCA du Sud-Ouest, Henri Desbruères of SNECMA and the other personalities on the Show Committee have every reason to be content. Attendance estimates vary, but some put the number of spectators at the Air Display on July 5th alone at 200,000, while others mention half a million. André Granet and Maurice Guilbot were rewarded, too. In a brief six months the former had re-erected his "Grand Palais" at Le Bourget; the latter, in his capacity as Director of the French Aircraft Industries Association and Manager of the Salon, looked a little worried in the first few days but soon found that everything was running smoothly. In the end even the weather was right. Once again the French showed that they are masters of the art of improvization, and once again they proved the validity of their old saying, "tout s'arrange..."

Some of the aircraft—in this case a Caudron two-seater fighter of 1915 which was still flying at Le Bourget in 1953—showed similarities . . .

. . . to certain types demonstrated this year at the Salon. The helicopter is the SE 3120 *Alouette*.

A day before the Salon opened its gates it was announced that the Marcel Dassault aircraft company, Hispano-Suiza and a large number of equipment manufacturers had scored a resounding success by concluding a substantial contract with the Government of India. The Paris Show, the equipment which was exhibited and demonstrated in flight, illustrated the basis of this success. They proved more than that, however. As little as two years ago, at the 19th Salon in 1951, the French aircraft industry was still groping along an uncertain path. Of the numerous prototypes exhibited, many were of doubtful practical value. At the same time, production was meagre. This has changed.

This year's Show clearly bore the traces of France's aviation policy over the past two

The scene at Juvisy airfield near Paris in 1909 was not . . .

. . . fundamentally different from that at Le Bourget in 1953.

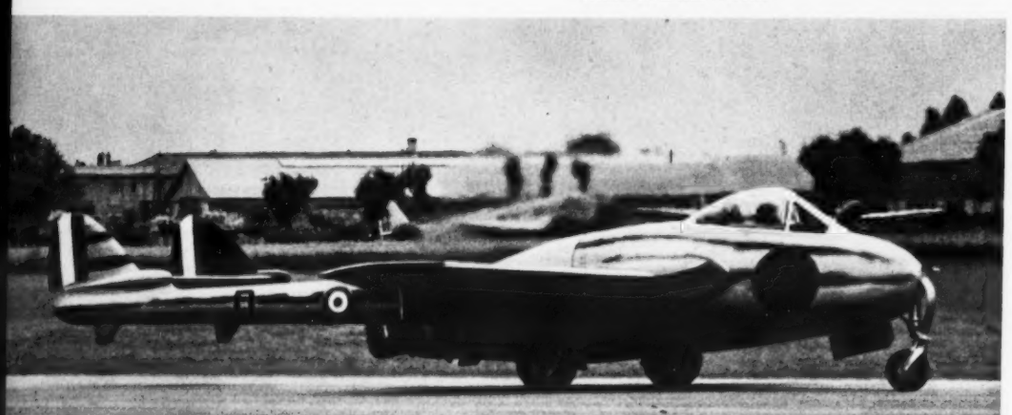
years, which obviously had pursued the following aims :

1. Reduction of prototype projects to a *rational* minimum ;
2. Concentration of France's inventive genius on the solution of *practical* problems ;
3. Procurement of *effective air power at reasonable cost ;*
4. Production of *fully-tested combat and other military and commercial* aircraft ;
5. *Filling of gaps* in the West's air panoply.

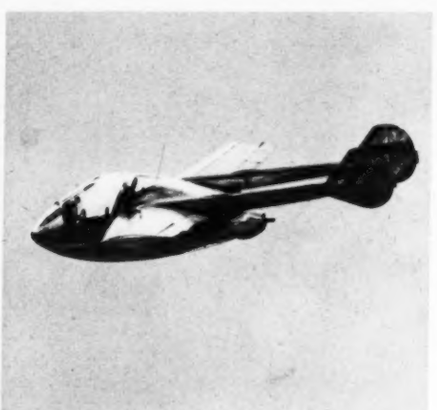
*

Coca Cola being advertised by Georges Février, *Interavia's* Manager for France, President of the Association of French Aviation Writers.

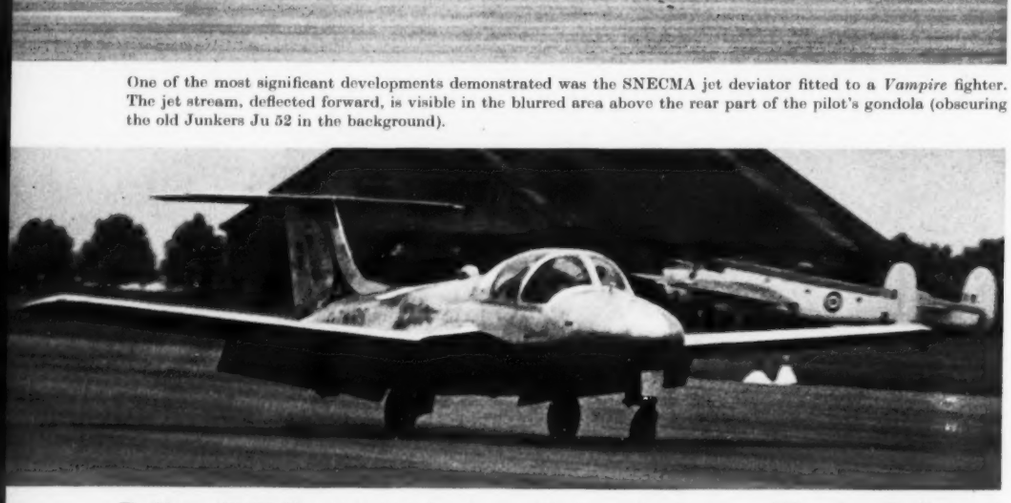
"Lost Children . . ." Air France hostesses looking out for the usual quota of strays.



One of the most significant developments demonstrated was the SNECMA jet deviator fitted to a *Vampire* fighter. The jet stream, deflected forward, is visible in the blurred area above the rear part of the pilot's gondola (obscuring the old Junkers Ju 52 in the background).



Jet trainers : the tiny SIPA 200 *Minijet* light trainer provoked exclamations of incredulity.



The Morane MS 755 *Fleuret* twin-jet trainer impressed by its speed and manoeuvrability.— Avro *Shackleton* anti-submarine aircraft in the background.

The butterfly tail unit of the Fouga CM 170 *Magister* jet trainer will be replaced by a vertical fin and rudder and a high-set tailplane in subsequent models.

The *Technical Review of the Paris Air Show* in this issue will provide descriptive details of the equipment shown on the stands in the Exhibition Hall—there were 186 of them, from nine different countries. More than 40 aircraft types were lined up in front of the new "Grand Palais" of Le Bourget or—reinforced by a substantial contingent of foreign "visitors"—demonstrated in flight.

The Sud-Ouest *Vautour,* if produced in the reasonably near future, would form a valuable addition to the NATO armoury as a high-speed all-weather fighter or ground support aircraft. The Dassault *Mystère IV,* which has been ordered into quantity production under U.S. off-shore and French Air Force contracts, has a promising future, as have even more advanced, as yet unavailable developments such as the *Mystère IVA,* the radome-nosed *Mystère IVB* and the *Mystère IVN* two-seater night fighter. The *Hurel-Dubois HD 31* high-

The Bréguet 960 naval attack aircraft (one *Mamba* turboprop, one *Nene* jet) shows off its generous flaps . . .

. . . and its deck landing equipment. Britain's Royal Navy is said to be interested.

aspect-ratio-wing aircraft and its successors may ultimately become the "DC-3 replacement" for which everybody is clamouring. The three French jet trainers, the Morane MS 755 *Fleuret*, the Fouga 170 R *Magister* and the SIPA S. 200 *Minijet*, certainly are types whose advanced design and operating economy will help to open the export markets to France. The Nord 2501 *Noratlas* transport is in production not only for the French Air Force but also for commercial and military operators in South America. The *Potez 75* single-engined ground support aircraft may not feature many aerodynamic refinements, but quite obviously it is a pure "tank buster." The Sud-Est SE 5000 *Baroudeur* light fighter and ground

The Nord 2200 naval fighter prototype has aroused renewed interest in French naval air circles. Here it is taking off with the help of a JATO rocket.

The *Trident* is regarded as an intermediate step on the way to the fully guided interceptor.

The SO 9000 *Trident* supersonic experimental fighter has two tip-mounted Turboméca *Marborés* of 880 lbs. s.t. each and a battery of SEPR rockets in the tail. Note the short wing span.

A fighter which dived at supersonic speed—the Hawker *Hunter* piloted by Neville Duke. It is also in production under U.S. off-shore orders.

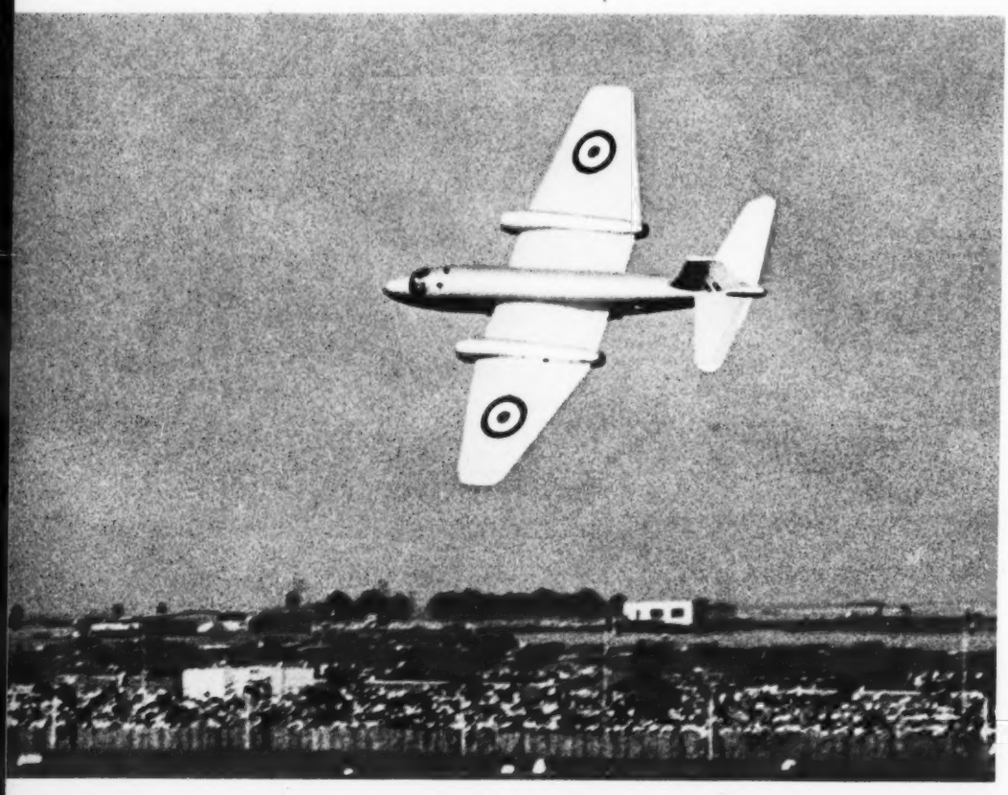
The second British fighter which provoked the supersonic booms at Le Bourget : the Supermarine *Swift Mark 4*, currently the Royal Air Force's favourite fighter, which was flown by Michael Lithgow.

Mystère IV in flight. Note the extended dive brakes. The aircraft has been ordered in quantity under U.S. off-shore contracts.

Dassault *Mystère IV* fighter which Col. Rozanoff dived at supersonic speed.

Dassault *Mystère II* fighter, about to go into quantity production for the French Air Force.

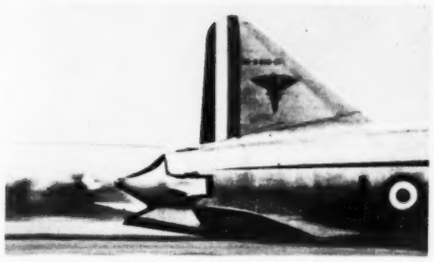
Mystère II in flight.



Wing Commander Beamont putting his English Electric *Canberra Mark 2* through its paces at Le Bourget.

attack aircraft, in whose creation the internationally known Polish designer W. J. Jakimiuk played a decisive part, indicates that logical, practical aims have been pursued. It is doubtful whether in the event of another war hard-surfaced runways measuring 6,000 ft. and more will be available everywhere behind the front. If the type goes into production, it will be the beginning of a new trend : it takes off on a trolley and lands on skids. Impressive was the demonstration of the SO 9000 *Trident* experimental short-life interceptor, powered by two Turboméca *Marboré* small jets and later to be fitted with a rocket battery (probably the 4-minute hot rocket unit experimentally installed in an *Espadon* prototype). With its small wing area and high speed, the *Trident* looks like an intermediate stage between the piloted aircraft of today and the guided interceptor of tomorrow.

One of the most significant demonstrations was that of a licence-built *Vampire* fighter



The SE 2410 *Grognard* twin-engined attack aircraft collected a pigeon in one of its engine intakes during a fast run. The pigeon pierced a hole and the ensuing vibrations slightly damaged the aircraft. Photo shows the normal location of one of the brake parachute doors after the latter had detached itself.

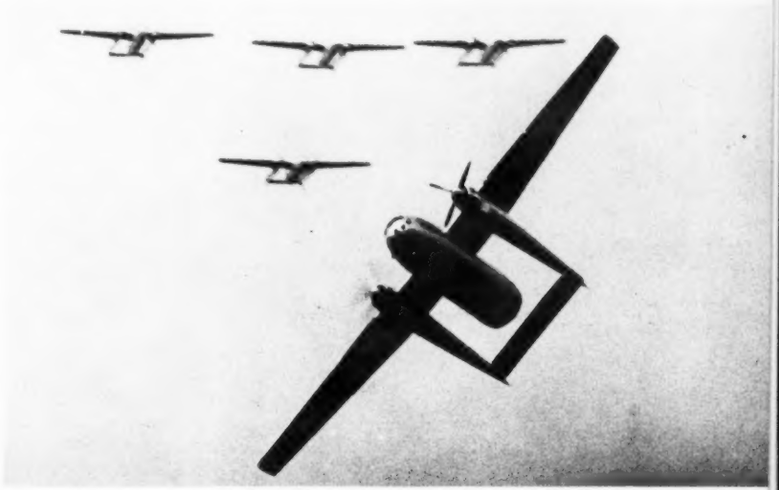
fitted with the *SNECMA thrust reversing device*, which may well show the way to greater safety in present military and future commercial jet operations. The arrangement worked to perfection and the machine landed in about half the distance of that normally required. Congratulations to SNECMA !

*

The SO 4050 *Vautour* twin-jet two-seater all-weather fighter/light bomber lands with the help of ribbon-type brake parachutes. It is said also to have flown at more than Mach 1.0 at Le Bourget.

The *Vautour* taxiing past the Bourget airport building.

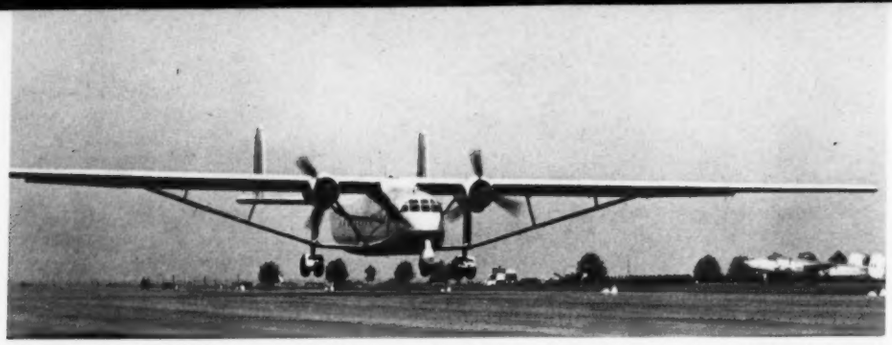
The Potez 75 is a heavily armoured anti-tank and ground-support aircraft.



A Nord 2501 *Noratlas* transport banks on one engine against a backdrop of four more aircraft of the type.

Two days, July 4th and 5th, had been allocated to the Flying Display. The weather on the first day was what the British have come to call "Coronation Weather," with ten-tenths cloud at about 2,000 feet, and the demonstrations were limited accordingly. But on Sunday morning, July 5th, Colonel Constantin Rozanoff, Dassault's Chief Test Pilot, woke up late-sleeping Parisians to a sunny day by diving his *Mystère IV* at supersonic speed from about 40,000 feet above the *Arc de Triomphe*. The resulting "bang-bang" not only broke a

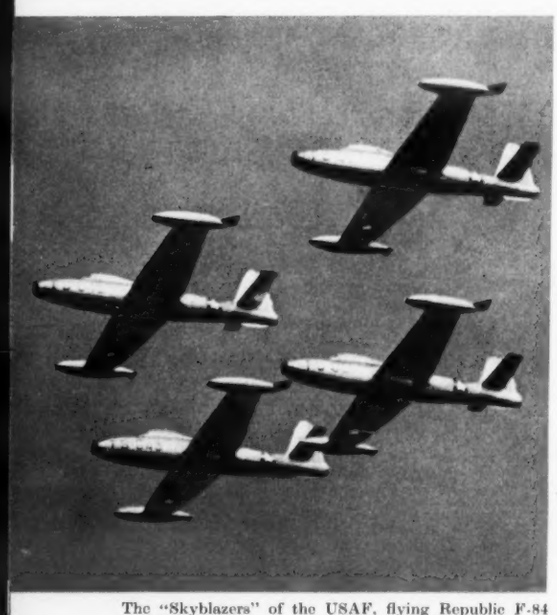
The Hurel-Dubois HD 31 transport prototype foreshadows one solution to the problem of short landings and take-offs at small fields.



The HD 31 had landed in about a quarter of the runway length. Instead of taxiing to the other end, the pilot, Fischl, took off again and flew the machine at three feet above the "deck" to the far end of the runway.

florist's shop window near the Champs Elysées and provoked mixed feelings in the fashionable Neuilly district, but it also had the desired publicity effect : in the afternoon Parisians trooped out to Le Bourget in their thousands. The supersonic "thunderclap" was repeated several times by British and French pilots in the course of the day. The attention it arouses means that we in Europe still marvel at something which in the U.S. Air Force or aircraft industry has become practically a daily occurrence . . .

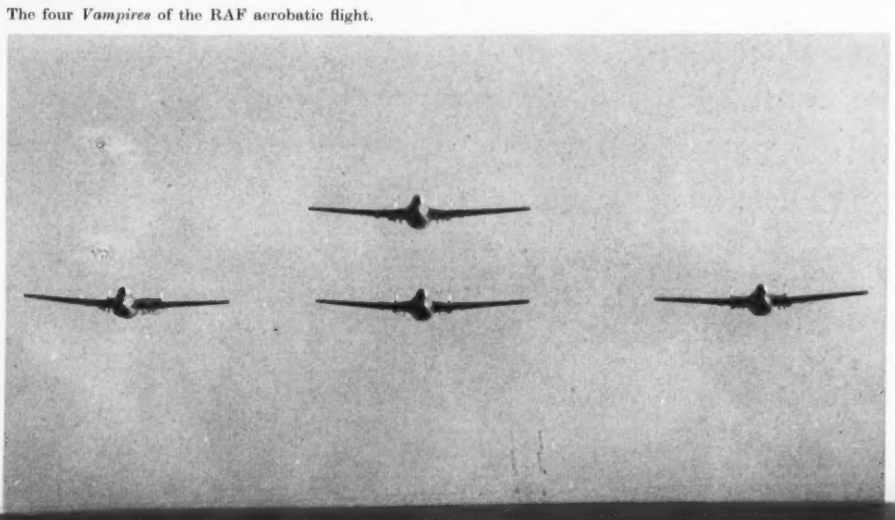
The international character of the Aviation Salon asserted itself also during the Flying Display. The Swedish Saab *Safir* trainer was shown in company with two *Cessna* personal aircraft, Fairchild *Packet* transports, Republic *Thunderjet* fighter-bombers, *Grumman* amphibians, *Hiller* and *Bell* helicopters, Boeing B-47 *Stratojet* bombers. The British gave impressive demonstrations of the Hawker *Hunter* and the Vickers Supermarine *Swift Mark IV* fighters, Avro *Shackleton* long-range patrol bomber and *Avro 707* experimental delta aircraft, English Electric *Canberra Mark II* light bomber and *Bristol 171* helicopter.



The "Skyblazers" of the USAF, flying Republic F-84 *Thunderjets*, again proved themselves pastmasters at jet aerobatics.

The French aerobatic flight of four *Thunderjets* making a fast pass at the field.

The four *Vampires* of the RAF aerobatic flight.



Paris Panorama

The picture parade on these pages conveys an impression of the display.

*

The *practical purpose* of these international aviation days could be gleaned at the countless cocktail parties, luncheons and dinners which French and foreign visitors had organized. A gathering arranged jointly by Rolls-Royce and Hispano-Suiza indicated the close collaboration between the two engine manufacturing companies. On another occasion United Aircraft Corporation had assembled the cream of French and European aeronautics. Mundy I. Peale, President of Republic Aviation, had not minced his words during a luncheon given by the American Chamber of Commerce in Paris : he was interested in the European market, and first contracts with SNCA du Sud-Est and Italian companies were in his pocket. Georges Héreil, President of SNCA du Sud-Est, conferred with Mr. Peale on one day and, with his colleague Glasser of SNCA du Sud-Ouest, with the heads of the de Havilland Aircraft Company on another to study with them his twin-jet transport aircraft project. At Marcel Dassault's cocktail party graceful Indian ladies mingled with the élite of the French Air Force. Seemingly it was a continuous celebration but in reality much practical and successful work was done: the fact is indisputable that France has now joined the United States and Great Britain as the third great arsenal of Western air power.

A Sikorsky S-55 helicopter, known in France under the delightful name of *Eléphant Joyeux*, planted a flagpole, complete with the *Tricolore*. SNCA du Sud-Est has acquired the S-55 manufacturing licence from United Aircraft Corp.

Technical Review of the Paris Air Show

Opening of 20th Paris Air Show ... Georges Héreil, President of SNCASE, in front of his firm's exhibits : SE 2410 *Grognard* ground attack aircraft : SE 2010 *Armagnac* airliner ; SE 3120 *Alouette* three-seat helicopter.

Heart and sinews of the aircraft

An "air arsenal of 1953" : jet aircraft of all sizes, from the tiny *Minijet* trainer to the supersonic bomber ; commercial transports for short, medium and long stages ; sports aircraft, helicopters ... some forty aircraft of all categories, all in flying order, were grouped in front of the exhibition hall that had been specially erected for the 20th Paris International Aircraft Show, and another dozen models were shown in flight in the flying display of July 4th and 5th. Even professionals had their work cut out to digest all their impressions. What then of the 200,000 curious who flocked out to Le Bourget for the public display on July 5th ?

Even those who stayed at home in the capital had a resounding sample of how a "break through the sound barrier"—still quite an event for us backward Europeans—affects eardrums and windows.

Today, because of the growing complexity of armament requirements, *equipment is king*. A successful aircraft entails a great deal more than an eye-catching design on paper, and its streamlined exterior hides a multitude of small items painstakingly brought to perfection.

This being so, we may justifiably leave the beaten track in reporting this year's Paris Show and begin with the aircraft's equipment, on which, when all is said and done, both engines and airframe are so largely dependent. *What the inside of an aircraft looks like* could be seen in the handsome exhibition building put up by André Granet, who has been Secretary General of the Paris Shows for 45 years. Let us therefore take a few practical examples from the wealth of equipment shown. These will be more eloquent than any long-winded description.

People in Paris

Interavia's amateur photographer walked through the 1953 Paris show one day, at random taking snapshots of aviation people exhibiting at or visiting the Salon. His photographic harvest provides a typical cross-section of the personalities who converged on Le Bourget. The photographer told us that at the next Salon he hopes to catch all those he missed this time and publish their pictures in double the size of those on these pages.

Official visitors : M. Vernet, French Aircraft Industries Association ; M. Maurice Heurteux, President of the Salon ; M. Paul Devinat, Minister of Public Works and Civil Aviation ; M. Lemaire, Secretary-General of Civil Aviation and Air Transportation ; M. G. Glasser, of SNCA du Sud-Ouest ; and M. Couhé, of the Paris Airports Authority.

Marshal Alphonse Juin, Chief of NATO forces, Central Europe ; General Martial Vallin, Inspector-General of the French Air Force ; *Ingénieur-Général* Mazer, Chief of the *Direction Technique et Industrielle*.

The banquet of AICMA *(Association Internationale des Constructeurs de Matériel Aéronautique)* : Left, delegates from Sweden, Holland and Italy, and, across the table to the right, from Switzerland.

What the inside of an aircraft looks like was demonstrated in the new exhibition building at Le Bourget . . .

We might start with that SO 4050 *Vautour* now cruising round above the airport. We all know that it is very fast . . . During its tests at Brétigny it reached supersonic speed in a dive. It is obviously also very manoeuvrable. But is it so generally known that the tremendous control forces in the transonic region can only be supplied by new hydraulic power controls for a pressure of 3 tons *(Etablissements Jacottet* and *René Leduc)* ? Details of this device were seen on stand 137, such as its relatively small jack for a 2,200 to 6,600 lb. pressure with tiny co-axial pistons and electrical vibrator to eliminate piston friction ; automatic change-over to hand control if required.

It may also be noted in passing that the *Vautour*'s great range (over 2,500 miles) could only be obtained by using a new weight-saving metal bonding process developed by SNCASO, that *SNCASO* and *Société Hispano-Suiza* made long series of experiments before they were satisfied with the undercarriage, that finally the development of the two ATAR 101 C axial-compressor engines took one department of *SNECMA* a whole eight years . . . Not to speak of details of the pilot's cabin (*SNCASO* ejector seats, *Aerazur* "G" suits).

To take another example, *guided weapons* are being made by all the great powers, France included. We need only recall the *Véronique* research rocket, made by the *Laboratoire de Recherches Ballistiques et Aérodynamiques* at Vernon, *SNCASE*'s SE 1522 and *Société Matra*'s anti-aircraft rocket, models and pictures of which were exhibited at the Show. But to get a real idea of the present stage reached by these new-type "flying machines," we must look at countless individual parts, such as gyrometers and servo equipment by *Société ECA,* fuel pumps and regulators by *Air Equipement* and *Bronzavia,* induction generators by *AiResearch,* radar and radio equipment by *Thomson Houston, Société Française Radioélectrique* and *Bendix.*

The age of equipment

Any attempt merely to list the multitude of different types of precision equipment on which the operating efficiency of modern aircraft depends would be hopeless. Even the list of equipment for a sports aircraft contains several hundred items, and that for a giant airliner runs into thousands. Then there is the ground equipment . . . All we can do is to give a word or two to the products of a few leading manufacturers who had up-to-date equipment on show in Paris.—The firms are listed alphabetically.

ABG (Paris, France) : ignition systems for piston engines and turbojets.

Aérazur (Paris, France) : of particular interest is the group of "waxworks" arranged around a SNCASO ejector seat (picture), with "G" suits, Mae Wests, crash helmets, oxygen masks and parachutes ; also rubber boats and brake parachutes.

Air Equipement (Asnières, France) : Lucas, Rotax and Bendix equipment made under licence, direct current generators and starter motors, also valves, switches, pumps, regulators and air compressors of original design. The fuel metering equipment for a Hispano-Suiza *Nene* (picture) was particularly interesting.

AiResearch (Los Angeles, USA) : A large selection of aviation products, including air conditioning plant for large airliners consisting of space-saving compressed air turbines with heat exchangers and dwarf automatic pressure and temperature regulators. An interesting new piece of equipment was a ram air turbine 14 or 15 ins. in diameter for emergency drive with attached hydraulic pump, which has a power of 5 to 6.5 h.p. for a speed of 140 knots, and weighs only about 17½ lbs.

Ateliers SEMCA (France) : Cabin pressure regulator for civil and military aircraft for altitudes of up to 39,300 ft. ; cooling blowers for *Mystère, Mistral* and *Sea Venom ;* auxiliary motors, de-icers, fittings.

A. V. Roe & Co. (Manchester, England) : Well-known as makers of delta-wing aircraft, presented, on the equipment side, a new-type space-saving release device for three 100-lb. bombs, weighing only 42 lbs.

Bendix (New York, USA) : World's leading equipment manufacturers, who have so far produced 300 special items for aviation, were showing ignition systems, flow regulators, generators, automatic pilots, measuring and checking instruments, meteorological equipment and radio, navigation and radar instruments. It is frequently quite unobtrusive items—of minimum dimensions but maximum performance and precision—

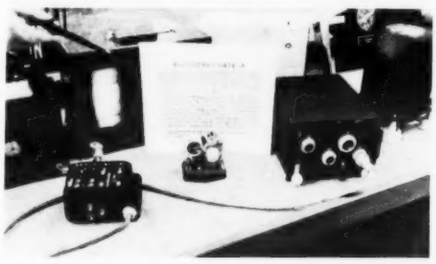
Ingénieur-Général Vernisse, Managing Director of SFECMAS, formerly Arsenal ; Jacques Piette, President and Director General of SNCA du Nord ; M. Berthaume, formerly Technical Consultant to the Air Ministry, now with SFECMAS.

Mundy I. Peale, President and General Manager of Republic Aviation Corp., whose company recently created two overseas subsidiaries, one at Lugano, Switzerland, the other in Paris, France.

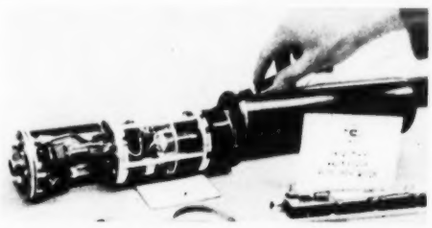
M. Georges Héreil, Chairman and Director-General of SNCA du Sud-Est, President of AICMA and President of the 1951 Salon.

In the aircraft park : *left,* facing camera, Louis Castex ; *in uniform,* Colonel Cressaty, Air Adjutant to the President of the Republic ; *next to him* M. Maurice Heurteux, of Hispano-Suiza, President of the Salon ; *Contrôleur-Général* Moutte and (with glasses) M. Hurel, of Hurel-Dubois.

Aérazur (France) : Life-size wax dummies with "G" suits and parachutes. On the left-hand cabin wall (behind the SNCASO ejector seat) an encased pressure regulating valve with manometer which sets the abdomen and thigh regions of the "G" suit under pressure via compressed air tubes. Even with a very high centrifugal force in turns the blood is thus prevented from draining into the lower half of the body.



Bendix (USA) and Elliott Brothers (Great Britain) : Miniature stabilizer for yawing oscillations in aircraft with automatic pilot (developed by R.A.E.).



Bendix (USA) : Airborne pulse repeater to follow trajectory of guided missiles by means of centimetre waves. The transmitter valves are the thickness of a finger.

which arouse the expert's keenest interest, for example an auto-stabilizer (developed jointly by RAE Farnborough, and Elliott Bros., London) and a pulse repeater beacon for guided missiles (picture).

Bronzavia (Courbevoie, France) : In addition to its well-known engine accessories and pneumatic and electrical equipment for all purposes, the company also had reflex and gyro sights for fighters (and camera guns) and bomb aiming apparatus with periscope (picture). Bronzavia's drift gauge is also of interest in aviation, as are the VHF airborne radio equipment, LF airborne receiver and VHF and HF ground stations developed by SARAM and distributed by Bronzavia.

Chausson (Asnières, France) : Oil radiators, heat exchangers, temperature regulators, heating apparatus (see also SECAN).

Curtiss Wright (New York, USA) : At last we had an opportunity to examine the Dehmel flight simulator type 400 (cf. *Interavia* No. 11/1952, p. 622), which has become practically indispensable for present-day pilot training in instrument flying and bad weather landing approach.

Dunlop (Paris, France) : The French branch of the world-wide Dunlop concern was showing tyres, wheels, brakes and a joystick for bombers.

Dowty (Cheltenham, England) : Hydraulic parts, fuel pumps, complete undercarriages (e.g. for the Avro *Vulcan*), shock-absorbing legs with fluid shock absorbers.

ECA (Asnières, France) : Stabilizing and measuring gyro with phase compensator (picture), tele-compasses, servo motors, spoiler controls for guided missiles. Practical application was shown by a demonstration lay-out for automatic flight and target homing on a point of light by guided weapons. The speed with which an optical target-seeking head (in the nose) makes the swivel-mounted model respond to the movement of a pocket lamp was amazing. The model made not only yawing motions but combined these—via another servo—with the necessary banking.

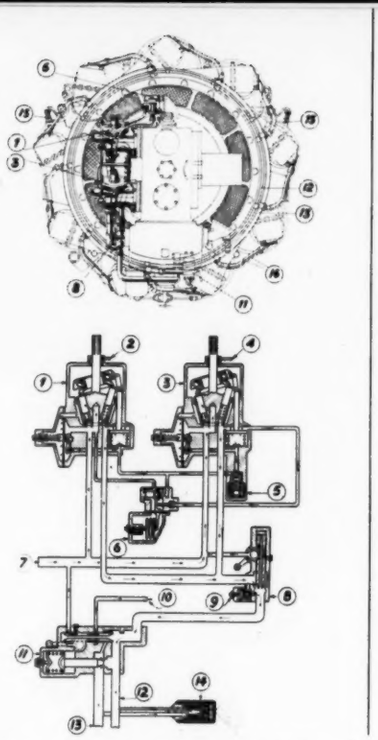
English Electric Co. (London, England) : Below the half-scale model of the famous *Canberra* jet bomber, a collection of electrical equipment for rotary and rectilinear drive.

ERS (Paris, France) : New-type magnetic stoppers for accumulators.

Fairey Aviation (Hayes, England) : Remote controls and pilot seats, alongside a full-size model of Fairey's VTO aircraft for vertical take-off.

Faure-Herman (Boulogne-sur-Seine, France) : An interesting space-saving consumption meter for fuel flows of up to 6,600 Imp. gallons an hour, which works with a calibrated impeller pulse relay and electrical remote-reading indicator (picture ; max. measuring error 1%) ; also revs. counters with double scale and forward and backward-return pointer.

Fermeture Eclair, Division Marston (Rouen, France) : Flexible fuel tanks, radomes and aerials, under Marston Excelsior Ltd. licence.



Air-Equipement (France) : Exterior view and diagram of fuel metering equipment for the Hispano-Suiza *Nene* turbojet (under Lucas licence).

1. Fuel pump I
2. Ventilation
3. Fuel pump II
4. Ventilation
5. Electric valve
6. Barometric regulator
7. Fuel feed
8. Main valve
9. No-load valve
10. Ventilation
11. Distributor and stop valve
12. No-load annular lead
13. Main annular lead
14. Duplex burner
15. Igniters
16. Fuel pipes

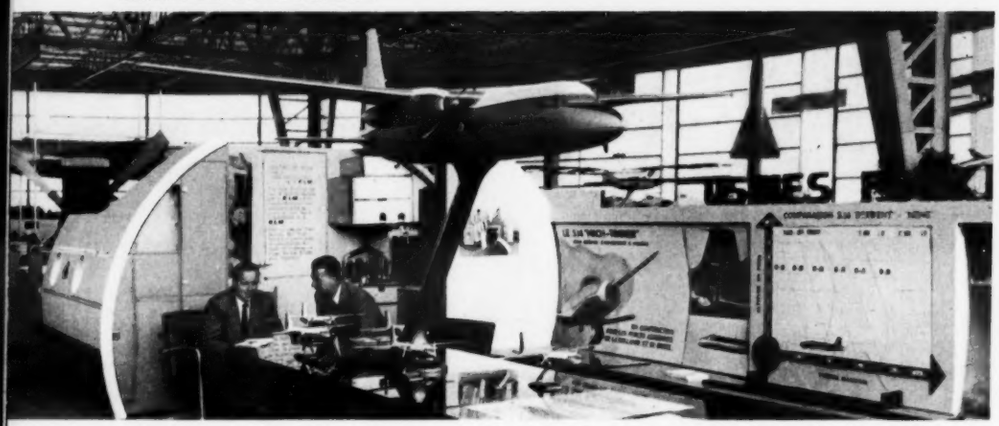
Bronzavia (France) : Automatic sight for fighters.

Left to right : M. Maurice Heurteux, Managing Director of Hispano-Suiza in France and President of the French Aircraft Industries Association ; *next but one* is Colonel Daum, *Ingénieur en Chef* and Deputy Chief of the *Direction Technique et Industrielle ;* Henri Desbruères, SNECMA; Henri Potez ; J. Jarry, President of AFITA *(Association Française des Ingénieurs et Techniciens de l'Aéronautique) :* Georges Février, of *Interavia ;* and Louis Bréguet.

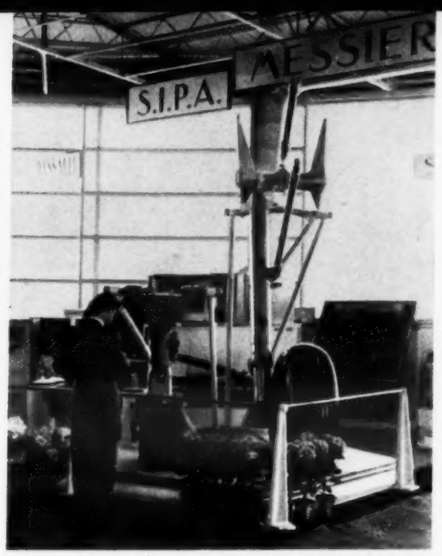
L. Verdier of Simavia ; Henri Potez.

The AICMA luncheon : at far left, M. Guilbot, Director of AICMA, the French Aircraft Industries Association ; *fifth from left,* Director Holm of Saab, followed by Director Vicherling of Fokker ; M. Granet, General Commissioner for the Salon, and Ingenieur-Général Bruno, President of the Italian Aircraft Industries Association.

Paris Panorama



Fokker (Holland) : Behind the 1:10 scale model of the F.27 *Friendship* propeller turbine airliner, the flashing galley of a KLM Lockheed *Super Constellation* . . . light construction for hearty Dutch meals.



Messier (France): Nose and main wheel for the Nord 2501 *Noratlas* twin-engined airliner and freighter. Rear right, the demonstration lay-out for the *Ministop* automatic brake pressure regulator, whose small size can be seen in the lower picture.

Hélices Ratier (Paris, France) : V.p. propellers, regulators, remote controls.

Hispano-Suiza (Bois-Colombes, France) : This well-known engine firm has also entered the equipment field, now that it is making undercarriages—for the SO 4050 *Vautour*.

Hobson (Wolverhampton, England) : Still leading in the production of carburetters, injection pumps, fuel regulators, flight instruments, hydraulic pumps and measuring equipment. A particularly interesting exhibit was a new power control with artificial feel.

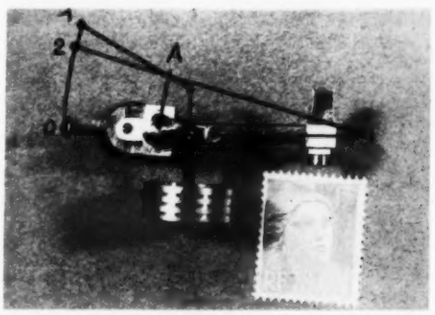
Jacottet (Courbevoie, France) : Remote controls of all kinds, in particular power-boosted controls for most of France's modern high-speed aircraft. Some are made under René Leduc licences and provide pressures of up to 6,600 lbs. Change-over to hand control if the hydraulic system fails. Jacottet servo controls are irreversible and have hydraulic control force simulators.

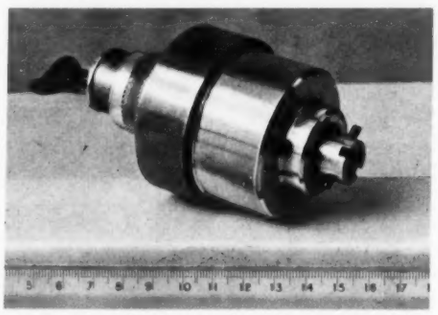
Jaeger (Levallois-Perret, France) : Mechanical and electrical rev. counters, altimeters, accelerometers.

Kléber-Colombes (Paris, France) : Tyres, pneumatic de-icers, for wing leading edges and propellers.

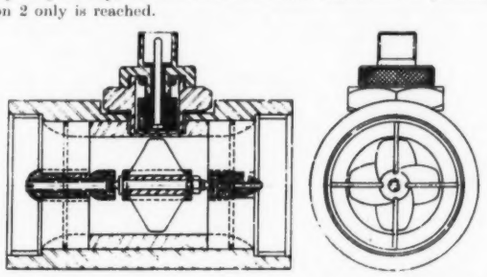
Labinal (Saint Ouen, France) : Aircraft generators and voltage regulators.

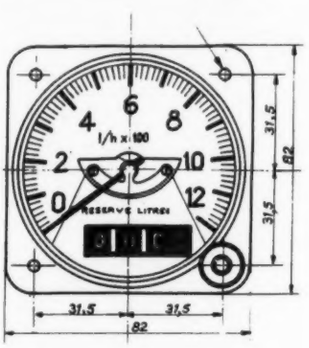
Laboratoire Central de Télécommunications, LCT (Paris, France) : Of special interest were the airborne and ground equipment for the centimetre-wave distance-measuring equipment, which is to be used in conjunction with VOR beacons for short-distance navigation by the Rho-theta system and for standard approach procedures. Each ground station can handle up to 50 calls from distances of up to 1000 nautical miles (at 10,000 ft. altitude) simultaneously. Sending and reply frequencies—960 and 1200 mc/s—correspond to ICAO standards.





ECA (France) : This tiny "phase compensator" for automatic pilots in guided missiles is of the utmost precision. For a *rapid* deflection of the measuring gyro, which brings the centre of lever to point A, the brake piston (next to the postage stamp) extends the control servo deflection to position 1. For a *slow* deflection on the other hand, position 2 only is reached.





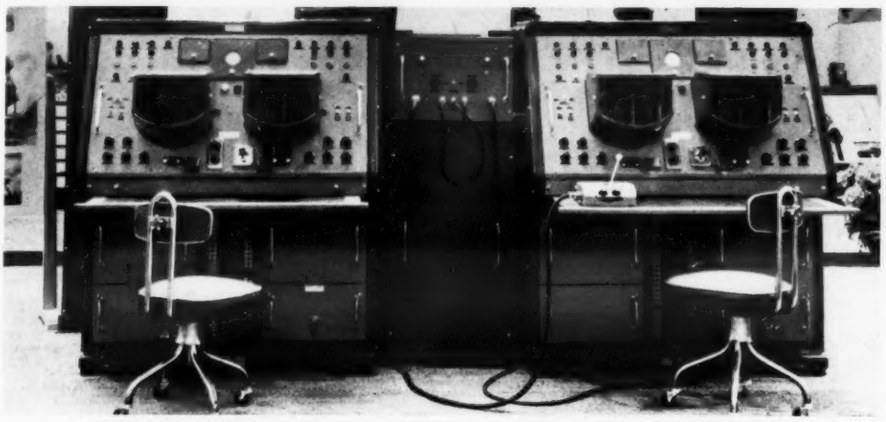
Faure-Herman (France) : Fuel flow meter for medium consumption (up to 265 Imp. gals./hr): calibrated impeller with pulse solenoid (above the impeller), electronic amplifier (not shown) and electrical remote-reading indicator for rate of flow and quantity remaining. The firm makes flow meters in four sizes, up to 6,600 Imp. gals./hr.

Mike Oliveau, Director of Douglas Aircraft's European Office, with headquarters in Geneva; Tanya Sikorsky, wife of Serge Sikorsky, United Aircraft's representative in Germany; and Mike V. Provikoff, Douglas Aircraft field service representative in Paris.

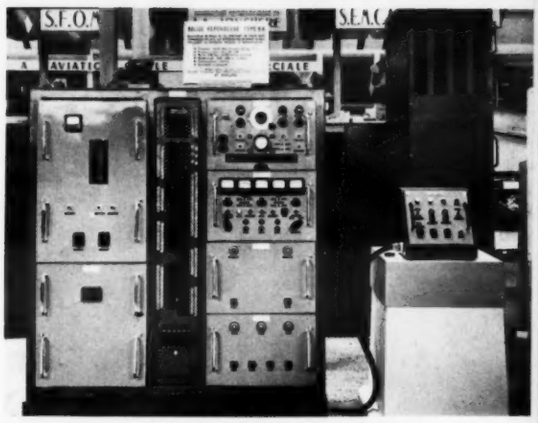
Gene Murphy, of Republic Aviation (France); Norman V. Clements, of United Aircraft Corp.; Jean Lignel, Managing Director of CGTA Air Algérie and well-known aircraft designer.

M. Vidal, Director General of Union Aéromaritime and Secretary-General of Chargeurs Réunis, shipping company, and M. Heurteux in front of the exhibition building extension.

Commander B. J. Hurren, Sales Development and Publicity Manager of Fairey Aviation Co. Ltd., and Admiral George Campbell Ross, Director of Aircraft Maintenance and Repair at the British Admiralty.



Thomson-Houston (France) : Training apparatus for GCA operators with daylight scopes. Flight path simulator for the "landing light pip" (whose joystick can be seen on the right-hand desk) between the two similar control desks. (This apparatus will be described in greater detail in issue No. 9.)



Thomson-Houston (France) : Fixed pulse repeater beacon with weatherproofed aerial, by which aircraft equipped with radar can measure azimuth and distance ; frequency in 3 cm band.

Le Matériel Téléphonique, LMT (Boulogne-sur-Seine, France) : Radio equipment of all kinds for all wave bands, D/F equipment and an instrument flying trainer of original design.

Lodge Plugs (Rugby, England) : Spark plugs and igniters for piston engines and turbine engines, also a chemical cleaner for spark plugs.

Marconi (Chelmsford, England) : Airborne and ground equipment for radio communications and radio navigation, in particular for the new HF telephony, and an elegant double control desk, designed for International Aeradio, with black, red and white telephone receivers.

Messier (Montrouge, France) : Leading French undercarriage manufacturers, showed retractable undercarriages of all sizes, from that for the Dassault MD 452 Mystère 2 to the nose and main wheels for the Nord 2501 twin-engined commercial transport and freighter (picture) and the Bristol *Britannia* propeller turbine airliner (the latter developed by the sister firm, British Messier). A working model shows in what an astonishingly short time a fully-loaded jet fighter wheel running at touch-down speed can be braked by means of the *Ministop* brake pressure regulator. The apparatus weighs only 11 ounces and has a length of $2^3/_8$ ins. and a diameter of 2 ins.

Normalair (Yeovil, England) : A collection of high-altitude oxygen and pressurizing equipment for the *Comet, Viscount* and *Britannia*. Of topical interest was the equipment consisting of three high-pressure oxygen flasks each containing 175 gallons at atmospheric pressure, used by Hillary and Tensing, the conquerors of Everest, in June 1953. Total weight of equipment 40 lbs.

N.V. Koninklijke Nederlandse Vliegtuigenfabriek Fokker (Amsterdam, Holland) : Various checking and measuring instruments, the flashing galley from a KLM Lockheed *Super Constellation*.

Phillips & Pain (Montrouge, France) : Fire-warning and fire-fighting equipment ; fire trucks for fire-fighting at airports.

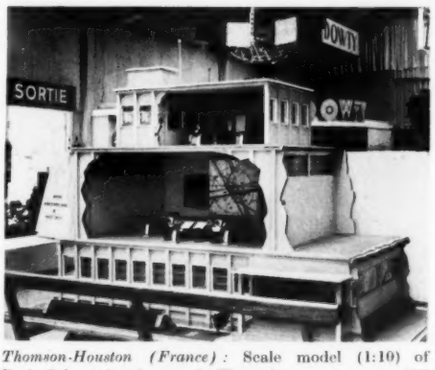
Potez (Paris, France) : In addition to aircraft engines (and a new ground attack aircraft), portable and jettisonable generator groups. A new one was the completely enclosed type I D 10, with 1.5 h.p. single-cylinder motor (3,000 r.p.m.), built-in fuel tank and 120 volt A.C. or 12/24 Volt D.C. generator as required (picture). The complete group, in a metal case 26 × 13 × 11 ins., weighs only 88 lbs. More powerful generator groups produce up to 18 h.p. max. power or 12 h.p. continuous power.

Ragonot (Paris, France) : Generators, electro motors and transformers.

Rellumit (La Garenne-Colombes, France) : micro filters for fuels and lubricants, automatic fuelling devices, pipe couplings and flexible tubes. An aircraft fuel system with automatic filling limit was of particular interest.

Rochar (Montrouge, France) : Electronic precision rev. counter and frequency gauge with an accuracy of 1/20,000 ; quick-stop equipment for A.C. motors ; electronic counters.

Rotol (Gloucester, England) : Four-bladed propeller for the Armstrong-Siddeley *Mamba* propeller turbine and eight-bladed contra-rotating propeller for the *Double Mamba ;* propeller regulators and rapid pitch-changing mechanism for feathered settings ; fuel metering equipment. Of special interest, the thermal de-icing system for the propeller hubs and blade leading edges in the *Viscount* and *Britannia* using 208 Volt direct current and approx. 6 kVA per propeller.



Thomson-Houston (France) : Scale model (1:10) of Paris-Orly regional control. The radar covers a zone 185 miles in diameter and up to 34,500 ft. in altitude : carrier frequency 2,700—2,900 mc/s ; pulse frequency 900 c/s ; pulse duration 1 microsecond. Directly underneath the search aerial, which rotates at 6 r.p.m., is the technicians' room, and another storey lower air traffic control's evaluation room.

Potez (France) : A handy portable and jettisonable metal case houses the Potez I D 10 petrol-electric generator group for 500 W d.c. or 500 VA a.c.

M. René Lucien, Chairman and Managing Director of Messier.

Colonel Michel M. Decker, *Ingénieur en chef* for Guided Missiles, Air Ministry, Paris, and Madame Decker.

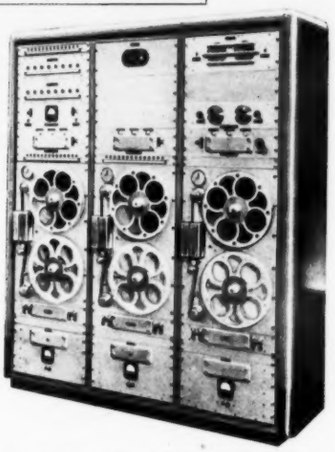
M. Louis Hurel of Hurel-Dubois, with M. George de Sonchen, his representative for the USA.

The official visitors in the exhibition hall : Left to right : M. Henri Potez ; M. Louis Couhé, Managing Director of the Paris Airports authority ; M. René Lemaire, Secretary-General of French Civil Aviation and Air Transportation ; *M. Paul Devinat*, Secretary of State for Public Works and Civil Aviation ; M. Henri Desbruères, President of SNECMA ; M. G. Glasser, Chairman and Director-General of SNCA du Sud-Ouest.

M. Pierre Bréguet with MM. Volland of Fouga and Malfanti of Air Equipment.

Paris Panorama

Société Française Radioélectrique (France) : Radar field unit (10 cm band) with rotating search aerial, panorama unit, distance measuring scope and altitude scope, with protective tent ; DECCA airborne equipment with Flight Log.



Thermionic Products (Great Britain) : Prototype of the 14-channel tape recorder with control tower. Left, the two recording bays, which work alternately ; right (with two loudspeakers in top compartment) the play-back unit.

United Aircraft Corporation (USA) : Gearbox for the Sikorsky S-55 helicopter, a product of the Sikorsky Aircraft Division. Alongside, models of the Chance Vought *Cutlass* and *Corsair*.

Société Andyar (Neuilly-sur-Seine, France) : Lightweight accumulators with zinc and silver plates of extremely low acid content. A 26 Volt battery with a capacity of 100 amp. hours weighs only 62 lbs. but is sufficient, thanks to its high top power (20 kW), to start an ATAR 101 or *Tay* turbojet.

Société d'Etudes et de Constructions Aéronavales, SECAN (Gennevilliers, France) : Jettisonable light metal auxiliary fuel tanks, stainless steel jet pipes for turbojet engines, radar aerials. SECAN has also obtained the exclusive world-wide manufacturing rights for the Lockheed *Speedpak* freight container for the Constellation.

Société Française d'Equipements pour la Navigation Aérienne, SFENA (Neuilly-sur-Seine, France) : Gyroscopes and magnetic compasses, automatic pilots and servos, remote controls, VHF R/T equipment, survey equipment and radar installations. Note a new automatic pilot for the Nord 2501 *Noratlas*.

Société Française d'Optique et de Mécanique, SFOM (Rueil-Malmaison, France) : Aerial cameras and lenses ; photographic equipment.

Société Française Radioélectrique, SFR (Paris, France) : A striking light-weight (1,760 lbs.) radar field equipment with tent, built up from elements weighing about 110 lbs. each (picture). Designed primarily for air raid warning, it can also move up with the tank forces; frequency approx. 3,000 mc/s, top power 500 kW, 5 h.p.-generator group. SFR was also showing a panorama equipment, high frequency tubes (clystrons) and a complete DECCA installation with Flight Log.[1]

[1] Details of the latest French radar developments will appear in the September, 1953, issue of *Interavia Review*.

Société Générale de Magnésium (Paris, France) : Cast and pressed parts of magnesium alloys.

Sourian & Cie. (Billancourt, France) : Weatherproof electric plugs and switches, to British, French and American standards.

Standard Telephones & Cables (London, England) : VHF and (of late once more) HF airborne R/T apparatus, the latter for ranges of up to 1,000 nautical miles and above. Also a VOR airborne receiver for 100 frequencies ; radio altimeters and automatic R/T D/F equipment.

Superflexit (Bois-Colombes, France) : Flexible tanks and tubes.

Téléflex (Paris, France) : Mechanical controls for a large number of aircraft types (and ships) of great precision.

Thermionic Products (Southampton, England) : Control tower tape recording equipment for up to 14 simultaneous radio channels (plus time recording) ; two bays (one stand-by), with play-back unit for two of the 14 channels simultaneously (picture). The recording tape has to be changed after four hours, but can be re-used when its recordings have been removed. Automatic switch-over to electrical or mechanical reserve set, and warning indications.

Thomson-Houston (Paris, France) : A very instructive exhibit was a 1:10 scale model of Paris-Orly regional control with surveillance radar equipment (picture). Also a training equipment for GCA operators with daylight scopes (picture) and a fixed repeater beacon for airborne radar unit for use in military navigation (picture).[1]

Turck (Cachan, France) : Infra-red target-seeking heads and radio remote controls for guided missiles.

Ultra Electric (London, England) : New semi-automatic emergency transmitter for "ditched" pilots, attached complete with rod aerial and battery, to the life jacket. The equipment is known as SARAH (Search and Rescue and Homing); its transmissions can be picked up by ships up to 6 miles away, by aircraft from a distance of 66 miles. Operating duration, 20 hours.

United Aircraft Export Corporation (London, England) : The international sales organization of the biggest aviation business in the world—United Aircraft Corp., of East Hartford, Conn., USA—is also very active in the equipment field. It showed above all Hamilton Standard products, such as air circuit cabin refrigeration plant for fighters and various hydraulic pumps, also instruments made by MB Manufacturing Co. and a helicopter gearbox of its Sikorsky Aircraft Division (picture).

Vibrachoc (Paris, France) : Shock absorbers of all kinds, particularly for instruments, of compressed steel wool, under licence from Robinson Aviation (Teterboro, USA). Unlike rubber, steel wool retains its elasticity almost indefinitely.

More and more powerful engines...

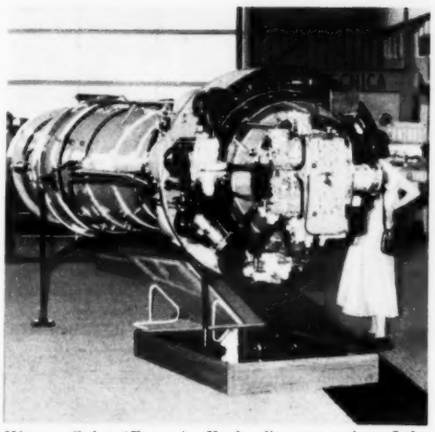
Both at the Paris air shows of post-war years and at the annual Farnborough display, one impression has been dominant : a considerable number of turbojets, externally little changed from year to year, but with higher and higher performance and longer endurance. Take the

Captain K. J. G. Bartlett, Director (Sales) of the Bristol Aeroplane Co. Ltd., greets M. Maurice Heurteux at the Bristol stand. *At right*, M. J. Chastellain, French Minister of Public Works, Transport and Tourism.

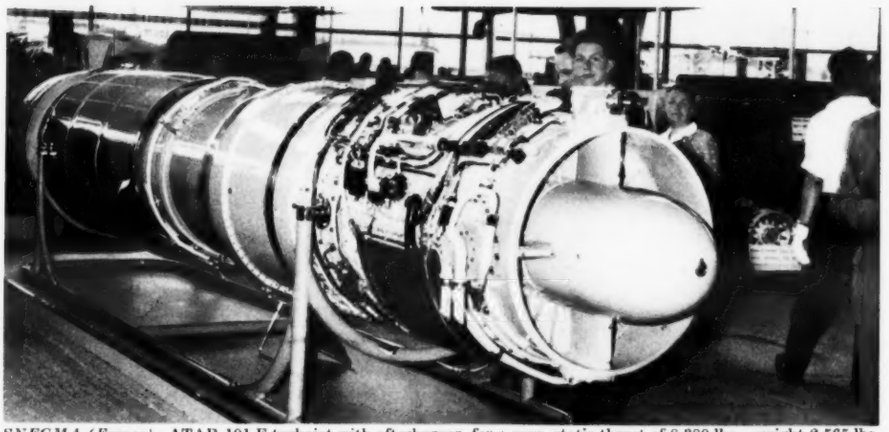
At the official *Salon* luncheon : Prince Bernhard of the Netherlands, M. René Pleven, France's Minister of National Defence ; M. Jacques Chastellain, French Minister of Public Works, Transport and Tourism ; M. Louis Christiaens, Secretary of State for Air at the Defence Ministry.

M. Joseph Szydlowski, founder and head of *Société Turboméca*, designers and manufacturers of small gas turbine engines.

There were plenty of cocktail parties all round. This cake was one of several which were devoured at the party given by the French Aircraft Industries Association at Le Bourget.



Hispano-Suiza (France) : Verdon licence version of the Rolls-Royce *Tay*, with 20% higher thrust (max. 7,720 lbs. without reheat), now under test.

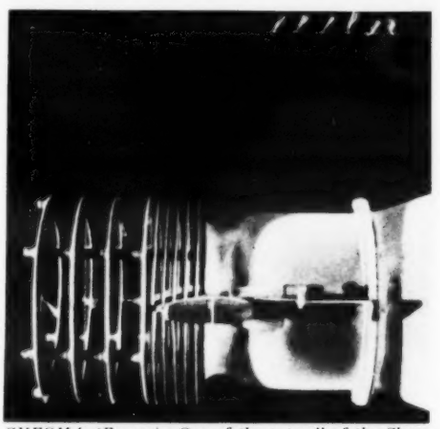


SNECMA (France) : ATAR 101 F turbojet with afterburner, for a max. static thrust of 8,380 lbs. ; weight 2,565 lbs. The diameter of the turbine wheel has been increased by 1.6 ins., compared with the first ATAR engines.

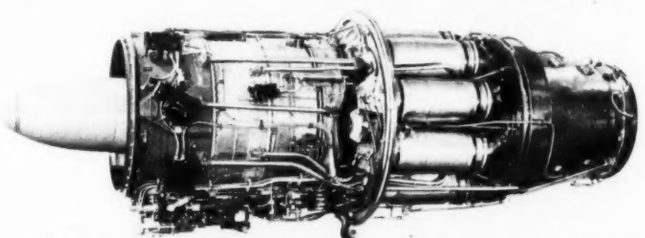
SNCASO (France) : Turboméca *Palas* take-off aid of 360 lbs. thrust, with special SNCASO cowling and accessories on the wing of a SO 30 P *Bretagne*. A novel feature is the air intake from below, to avoid windmilling.

SNECMA *ATAR 101* (France), for example. In 1948 the prototype delivered roughly 3,750 lbs. static thrust, in 1949 it reached 4,850 lbs. for short periods. The engine shown in 1951 had already got to 6,170 lbs. on a 15-hour test run, whilst the mighty ATAR 101 F—the "hit" of the 1953 Salon—has a thrust of 8,380 lbs. with reheat (for "tomorrow" an ATAR 101 G version with a thrust of more than 8,800 lbs. is planned).

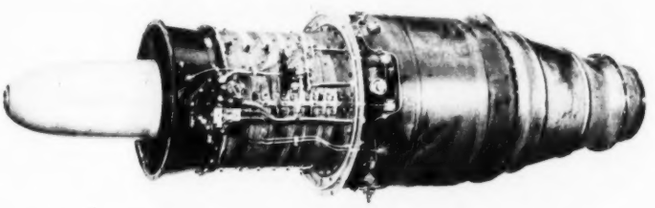
Another example : the thrust of the Rolls-Royce *Tay* (Great Britain), a development of the *Nene,* was given as 6,280 lbs. Today, the *licence version built by Hispano-Suiza* (France) under the name of *Verdon* has already reached thrusts of 7,700 lbs. without reheat on the test bench . . . And the Rolls-Royce *Avon* (Great Britain ; licence production in France, Belgium,



SNECMA (France) : One of the "stars" of the Show, the jet deviator, also demonstrated in operation (recognizable from the wool tufts). Compressed air tapped from the compressor pushes the gas jet flowing out of the jet pipe into the reversal rings.



Svenska Turbinfabriks A.B., Ljungström (Sweden) : STAL *Dovern 2* turbojet of all-steel structure, for 7,275 lbs. max. static thrust, weight 2,410 lbs.



The "short-life" *Viper* turbojet, an Armstrong-Siddeley design, is being built in France by Dassault under a recent licence agreement.

Igor I. Sikorsky, Engineering Manager of Sikorsky Aircraft Division, United Aircraft Corp., reading something about Sikorsky helicopters.

Dr. Giuseppe Gabrielli, Managing Director of the Aviation Division, Fiat company, Turin.

M. Louis Bréguet *(right)* in conversation with Professor Jacques Valensi, of Marseilles.

Captain John Jay Ide, USN, Representative of the U.S. National Advisory Committee for Aeronautics (NACA) in Europe.

M. Georges Héreil, Chairman and Director-General of SNCA du Sud-Est, and M. Maurice Heurteux, of Hispano-Suiza, President of the Salon.

Paris Panorama

MAKER AND TYPE	Country	Take-off power h.p. or lbs.	At r.p.m.	Max. continuous power h.p. or lbs.	At r.p.m.	Length inches	Width × height or diameter inches	Bore × Stroke inches	Stroke volume cu.in.	Dry weight lbs.	Cruising consumption (lb./h.p.h or lb./lbt.h)
Piston engines											
Minié 4 DF 28	F	—	—	65 h.p.	—	29.25	32.9×17.75	3.9×3.6	170.9	196	0.50
Lutétia 6 A 01	F	70 h.p.	2,600	—	—	37.1	19.7×19.7	2.4×2.4	123.9	132	—
Alfa Romeo 110 Ter P	I	155 h.p.	2,400	148 h.p.[1]	2,250	48.5	23×30.5	4.6×5.5	373.4	360	—
Potez 4 D 01	F	158 h.p.	2,520	153 h.p.	2,500	47.5	20.1×26.3	4.9×4.7	356.9	316	0.47
SNECMA 4 L 02	F	168 h.p.	2,500	168 h.p.	2,500	appr. 55	19.7×31.5	4.7×5.5	386.3	350	—
Potez 4 D 31	F	218 h.p.	2,600	197 h.p.[1]	2,500	47.5	20.75×28.4	4.9×4.7	356.9	366	0.50
Alfa Romeo 115 Ter	I	222 h.p.	2,400	212 h.p.[1]	2,250	64.6	19.7×32.9	4.6×5.5	560.2	514	—
Potez 6 D 00	F	236 h.p.	2,530	228 h.p.[1]	2,500	61	20.1×26.3	4.9×4.7	538.8	485	0.48
Salmson 8 AS 04	F	256 h.p.	—	—	—	—	—	—	—	—	—
Potez 6 D 30	F	300 h.p.	2,400	256 h.p.	2,400	—	—	4.9×4.7	538.8	573	0.50
Alfa Romeo 121	I	395 h.p.	3,000	350 h.p.[1]	3,000	76.9	26.9×27.6	4.7×4.3	607.2	760	—
Potez 8 D 30[3]	F	445 h.p.	2,800	395 h.p.[1]	2,700	67.75	31.2×31.6	4.9×4.7	713.9	740	0.48
SNECMA 14 X H[3]	F	800+h.p.	2,700	645 h.p.	2,650	53.8	41.7	4.8×4.6	1,159.5	1,390	0.47
Hispano-Suiza 12 Z 17	F	1,475 h.p.	2,400	—	—	94.9	29.1×39.4	5.9×6.7	2,196.9	1,520	—
SNECMA *Hercules 758*[4]	F	2,040 h.p.	2,800	1,670 h.p.	2,500	63	52	5.75×6.5	2.360	2,140	0.42
Bristol *Centaurus 661*	GB	2,625 h.p.	2,800	2,265 h.p.[1]	2,500	74	57.75	5.75×7	3,270	3,410	—
Wright Turbo-Cyclone 18[5]	USA	3,250 h.p.	2,900	2,650 h.p.	2,600	appr. 92	appr. 57	6.125×6.312	3.350	3,514	0.4
Propeller turbines											
Turboméca *Marcadau*	F	395 e.s.h.p.	—	315 e.s.h.p.	—	54.7	17.75×21.4	—	—	307[6]	—
Rolls-Royce Dart 505	GB	1,515 e.s.h.p.	14,500	1,210 e.s.h.h.	13,800	95	38	—	—	1,030	—
Armstrong-Siddeley *Double Mamba ASDM.1*	GB	2,950 e.s.h.p.	15,000	2,360 e.s.h.p.	14,500	101.8	52.8 ×43.85	—	—	2,125	—
Bristol *Proteus 600*	GB	3,500 e.s.h.h.	10,000	—	—	113.4	38.5	—	—	3,200	0.51 lbs./e.s.h.p.h
Pratt & Whitney PT2F-1 (T-34)	USA	5,600 e.s.h.p.	11,000	5,145 e.s.h.p.	10,570	157.4	34.06	—	—	2,564	0.698 lbs./e.s.h.p.h
Turbojets											
Turboméca *Marboré II*	F	395 lbs.	—	355 lbs.	—	43.3	22.3 ×11.4	—	—	300-310	—
Armstrong-Siddeley *Viper 2*[7]	GB	1,575 lbs.	—	—	—	65.4	23.25	—	—	appr. 365	—
De Havilland *Ghost 50*[8]	GB	5,000+lbs.	10,250	4,300 lbs.	9,750	115.5	53.1	—	—	2,160	—
Hispano-Suiza *Nene 105*[9]	F	5,180 lbs.	12,500	—	—	96.8	49.6	—	—	1,610	—
Hispano-Suiza *Tay 250*[10]	F	6,280 lbs.	11,000	—	—	99.6	50	—	—	2,015	—
STAL *Dovern IIA*[11]	S	7,275 lbs.	7,200	5,730 lbs.	6,800	151.6	43.1	—	—	2,630	0.92 lbs./lbt.h
Hispano-Suiza *Avon RA.7*[9]	F	7,500+lbs.[12]	—	—	—	119	42.4	—	—	2,346	—
Armstrong-Siddeley *Sapphire 101*[13]	GB	8,000+lbs.	—	—	—	134	37.4	—	—	2,600	0.85 lbs./lbt.h
SNECMA-ATAR 101F	F	8,380 lbs.	—	—	—	—	36.25	—	—	2,565[14]	—
Bristol *Olympus*	GB	9,750+lbs.	—	—	—	124	40	—	—	3,520	0.766 lbs./lbth
Pulse-jets, ramjets and rocket engines											
SNECMA *Escopette* 3340	F	22 lbs.	—	—	—	113.4	6.1	—	—	10.6	1.8 lbs./lbt.h
SNECMA *Ecrevisse*[15]	F	44 lbs.	—	—	—	60.6	—	—	—	13	2.2 lbs./lbt.h
SFECMAS S.600	F	1,320 lbs.[16]	—	—	—	127.9	23.6	—	—	160	1.9 lbs./sec[17]
Armstrong-Siddeley *Snarler*[18]	GB	2,000 lbs.	—	—	—	—	—	—	—	215	—

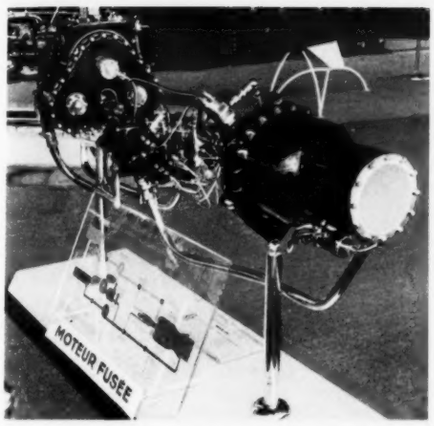
[1] Rated power. [2] Helicopter engine. [3] Potez 8 D 32 of 445 h.p. take-off power for pusher propeller, with fan cooling (Potez 75). [4] Bristol 758 made under licence by SNECMA for the Nord 2501. [5] Compound engine ; take-off power 3,500 h.p. with water injection. [6] Without propeller. [7] Licence production in France by Dassault. [8] Licence production also by Svenska Flygmotor and Fiat. [9] Rolls-Royce licence. [10] Rolls-Royce licence ; known as *Verdon* in France ; latest version delivers 7,720 lbs. take-off thrust at 11,100 r.p.m. without reheat, or 9,920 + lbs. at 11,100 r.p.m. with reheat ; corresponding engine weight 2,020 lbs. and 2,800 lbs. [11] *Dovern IIB* with de-icer, otherwise as IIA ; *Dovern IIC* with reheat, otherwise as IIB. [12] 9,500 lbs. take-off static thrust with reheat *(Avon RA.7R)*. [13] Produced under licence by Curtiss-Wright as the J-65. [14] With jet pipe and afterburner. [15] The B version delivers 66 lbs. thrust for a weight of 22 lbs. ; length 97.6 ins. ; minimum consumption 1.35 lbs./lb.t.h. [16] 1,320 lbs. thrust at a sea level forward speed of 620 m.p.h. [17] Consumption 1.9 lbs./sec. at 1,320 lbs. thrust and 620 m.p.h. [18] Liquid rocket.

M. Jules Jarry, President of AFITA, with M. Joseph Szydlowsky, head of Turboméca.

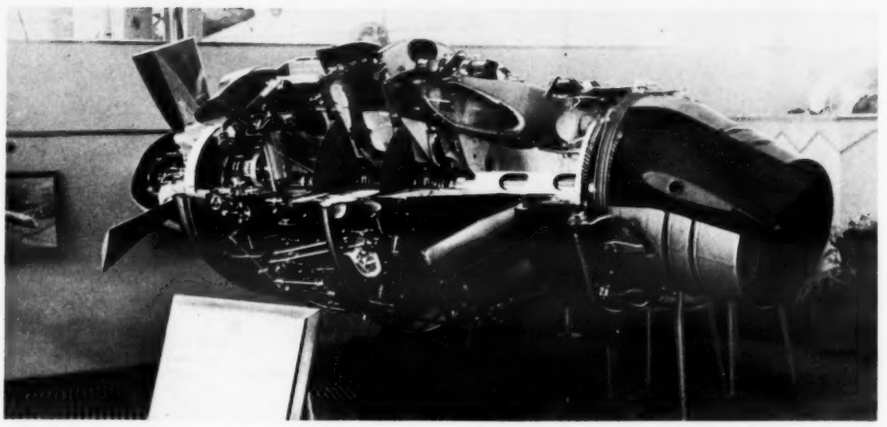
Lt.-Col. Pierre Gallois, of the French Air Force Staff, Chief of the Cabinet of General Lechères, who retired in July.

J. Lecarme, of SNCA du Sud-Est, inspecting the ejector seat of SNCA du Sud-Ouest.

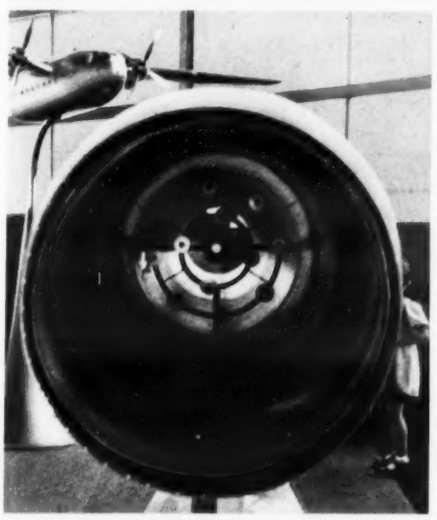
Right : Professor Dr. Theodore von Karman, Chairman of NATO's Advisory Group for Aeronautical Research and Development (AGARD), accompanied by a group of scientists.



Armstrong-Siddeley (Great Britain) : Driven by Methanol and liquid oxygen, the *Snarler* rocket engine's thrust is nearly ten times its weight : thrust 2,000 lbs.; weight 215 lbs.



Rolls-Royce (Great Britain) : Cut-away model of the *Dart* propeller turbine (1,515 e.s.h.p.) with two-stage radial compressor, seven combustion chambers, two turbine wheels, downward sloping jet pipe. Powers the Vickers *Viscount* medium-range airliner.



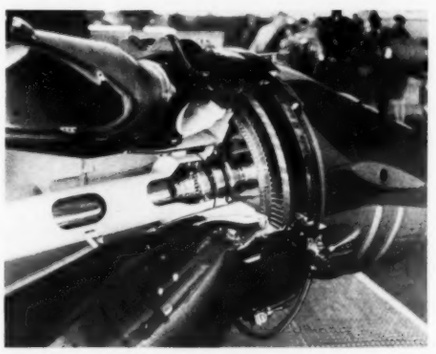
SFECMAS (formerly Arsenal, France) : Subsonic ramjet, 23.6 ins. in diameter, for a sea level thrust of 1,320 lbs. at 620 m.p.h.

SNECMA (France) : The new *Ecrevisse* flapless pulsejet has a longer smooth-tube detector than its predecessor, the *Escopette :* thrust 44 lbs.; weight 13 lbs.

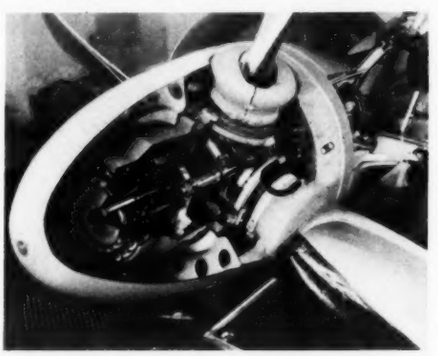
Sweden) has increased from 6,500 lbs. max. thrust (1951) to 7,500 lbs., with the operating time between two major overhauls having been raised to 600 hours (higher-powered versions are undergoing tests). Corresponding operating time for the Rolls-Royce *Derwent,* for example, is 250 hours, and for certain small engines no more than 15 hours.

New competitors, too, have joined the performance race during recent years, making their public début in Paris. Special interest was aroused by the Swedish STAL *Dovern 2* all-steel engine (7,270 lbs. thrust ; cf. *Interavia,* No. 5/1953, p. 258 et seq.) and the British Armstrong-Siddeley *Viper* short-life engine (1,575 lbs. thrust), which is shortly to be built under licence in France by *Marcel Dassault* and —apparently with higher thrust for a light interceptor fighter—was already on show on Dassault's stand.

At the other end of the performance scale were the internationally known miniature jets (and shaft engines) of *Société Turboméca* (France), in particular the *Palas* (350 lbs. thrust) fitted in the SIPA *Minijet* and the Fouga CM. 8-R and also to be used as take-off aids for commercial transports, and the *Marboré II* (880 lbs. thrust) used in fighters



Rolls-Royce (Great Britain) : The two turbine wheels (top) and the propeller drive (bottom) for the *Dart.* The front turbine wheel drives the two-stage radial compressor, the rear wheel the propeller.

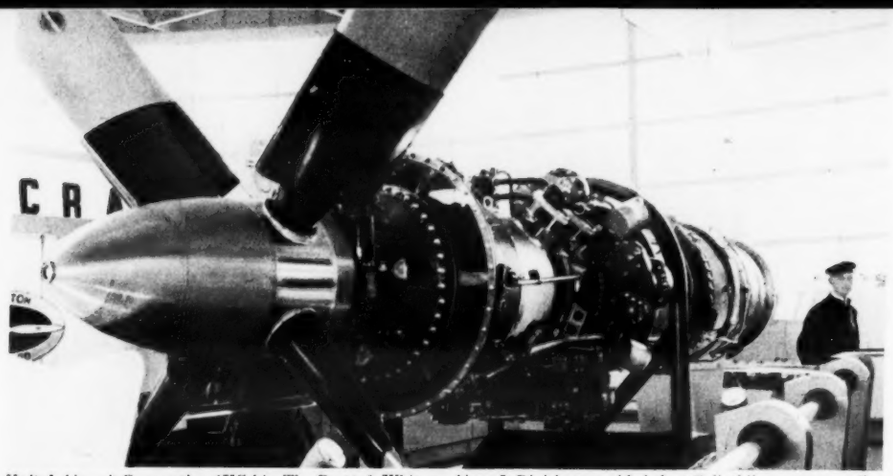


Centre, J. H. Davis, European Representative of Canadair Ltd., with headquarters in London. *Left,* Karl Larsson, Canadair's Chief Sales Engineer ; *right,* Bob Kinkead, European Representative of Republic Aviation.

M. Racine, of SNECMA.

Norman V. Clements, Director of Sales Promotion, United Aircraft Corporation.

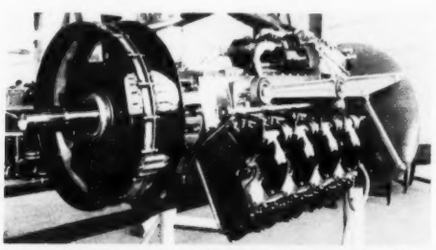
Left foreground : M. Massugé, Hispano-Suiza's oldest collaborator ; *behind him,* M. Granet, General Commissioner for the Salon ; *centre,* General Lechères, Chief of Staff of the French Air Force (retired in July) ; *right foreground,* M. Maurice Heurteux, of Hispano.



United Aircraft Corporation (USA) : The Pratt & Whitney Aircraft Division provided the "Goliath" among propeller turbines in the shape of the 5,600 e.s.h.p. PT2F-1 (or T-34). As this engine weighs only 2,564 lbs., its weight/power ratio is only 0.46 lb./h.p. . . . an unheard-of record.

Turboméca (France) : And this is the "David" of the turboprops, the new 395 h.p. *Marcadau*, a propeller turbine version of the *Artouste 2* shaft turbine.

Lutetia (France) : An "oddity" among the radial engines, the 70 h.p. two-stroke 6 A 01 with *six* air-cooled double cylinders.



Potez (France) : Eight-cylinder 445 h.p. 8 D 32 Vee engine designed to drive pusher airscrew, with fan cooling. This is the engine fitted in the Potez 75 prototype.

(SO 9000 *Trident*) and fighter trainers (Fouga *Magister* and Morane-Saulnier *Fleuret*). These engines were described in a recent issue (*Interavia*, No. 4/1953, p. 204 et seq.). It may now be added that, contrary to earlier reports, Turboméca is by no means interested only in the design of turbojets and turboprops, but is also prepared to produce them in quantity. Somewhere about 25 turbine engines of all types are already being turned out every month, and quantity production of the *Marboré II* is to begin in the autumn ; the Turboméca factory is at present tooling up and procuring the necessary materials. Production rights (hitherto granted to the United States and Great Britain) are therefore being given only in special cases, where it appears to be essential for currency or other reasons.

It would be quite impossible to go into details of all the engines—somewhere about the half century mark—shown in Paris. Our pictures merely record some of the more striking show pieces, and the adjoining table of engines gives some of their data. Piston engines continue to hold their place, not only *Bristol*'s sleeve-valve engines (Great Britain ; licence production by SNECMA, France) and the economical *Turbo Cyclone* compound

Power plant for the Hiller 360 helicopter (shown by Hélicop-Air), with upright six-cylinder 200 h.p. *Franklin* horizontally-opposed engine. Another piston engine for helicopters—the nine-cylinder 9 NH radial of 215 h.p. with vertical shaft—was shown by *Salmson*.

engines of *Curtiss Wright* (USA), but also medium and low power engines by *Hispano-Suiza, SNECMA, Potez, Minié, Lutétia* (all France) and *Alfa Romeo* and *Piaggio* (Italy). Special mention should be made of *Salmson*'s engines (France) : the 215 h.p. 9 NH air-cooled

Serge Sikorsky, son of Igor, United Aircraft Corporation's representative in Germany.

Professor Kurt Tank, former Technical Director of the German Focke-Wulf aircraft company, now with the Argentine State Aircraft Factory ; he is still interested in the European aircraft industry.

G. C. Snyders, Managing Director of Avio Diepen, of Ypenburg, near The Hague.

Ingénieur-Général Paricaud, Director of Contracts and Production at the French Air Ministry.

In the Press Tent : left, Jacques Noetinger, press officer to the French Aircraft Industries Association ; *right,* Georges Février.

Centre : M. G. Glasser, Chairman and Director-General of SNCA du Sud-Ouest ; *left :* ex-Colonel Kastner, Director of the Association of the German Aircraft Industry ; *right :* Fritz Siebel, founder of the former German Siebel aircraft works.

helicopter radial engine (with vertical cylinders) for the SE 3120 *Alouette ;* the 255 h.p. eight-cylinder 8 AS 04 Vee engine (a development of the Argus AS 10 C) ; the 90 h.p. five-cylinder 5 AQ 01 radial for sports aircraft.

The "star" of the engine show . . . Main interest was undoubtedly centred on the *5,600 e.s.h.p. PT2F-1 propeller turbine of Pratt & Whitney* (USA), today's most powerful engine for propeller drive. Of the second "hit of the 1953 Show," *SNECMA's jet deviation system* (France) for braking the landing of jet aircraft, all that could be seen on SNECMA's stand was an inconspicuous picture (which we photographed), though the demonstration of jet reversal in the flying display on July 4th and 5th gave an impressive practical example.

Finally a word on the "futuristic" *ramjet, pulse-jet and rocket* engines at the Paris Show, namely, the *SFECMAS* (France, formerly Arsénal) subsonic ramjet (1,230 lbs. thrust), *SNECMA*'s (France) new *Ecrevisse* type A (44 lbs. thrust) and type B (66 lbs. thrust) ; the Armstrong-Siddeley (Great Britain) *Snarler* rocket engine (2,000 lbs. thrust) ; a rocket engine for 8,800 lbs. thrust built by *Laboratoires de Vernon* (France) for installation in the *Véronique.*

The aircraft

It has always been a characteristic feature of the *Salon* that production models of the recent past and today's prototype should be mixed with projects for both the immediate and the more distant future. This tradition was followed by exhibitors again this year.

The crop of the past two years was distinctly impressive, as witness the *round dozen new French*

Hurel-Dubois (France) : The HD 31 narrow-wing airliner (two 800 h.p. Wright R-1300 engines) spans no less than 147 ft. 8 ins. It has an astonishingly short take-off and landing run and good climbing performance (aspect ratio 20.2). The HD 32 production version is to have Pratt & Whitney R-1830 engines and accommodation for 40 passengers.

Bréguet (France) : The double-decker Bréguet 763 *Deux Ponts* airliner for 107 passengers or 14 to 16 tons of freight, in Air France's colours (four Pratt & Whitney R-2800 CA. 18 engines).

Société Industrielle pour l'Aéronautique, SIPA (France) : with two two-seat trainers of new and old style : in front, the tiny *Minijet* jet aircraft (Turboméca *Palas* of 350 lbs. thrust) ; behind, the SIPA S.12 (570 h.p. SNECMA 12S 02).

North American F-86 Sabre (built under licence by Canadair) of the Royal Canadian Air Force.

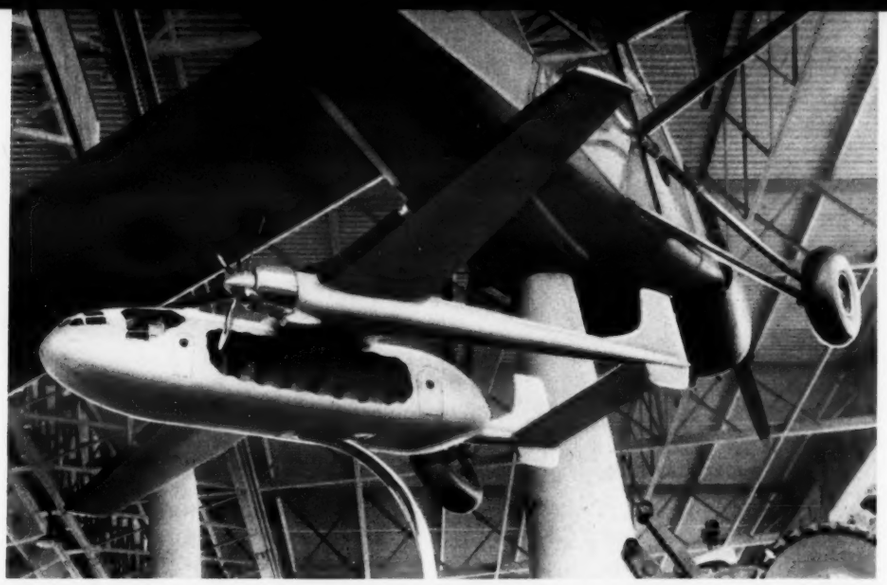
Morane-Saulnier MS 733 (France) : behind it a U.S. Air Force Fairchild C-119 *Flying Boxcar* (left).

Potez 75 (France), prototype (power only 445 h.p.) of an armoured ground attack aircraft (right).

MAKER AND TYPE	Country	POWER PLANT			DIMENSIONS			WEIGHTS			PERFORMANCE			
		Maker and Type	Take-off power		Span	Length	Wing area	Weight empty	Gross weight	Max. payload	Max. speed	Cruising speed	Ceiling	Max. range or endurance miles or hours
			h.p.	lbs.	ft. ins.	ft. ins.	sq.ft.	lbs.	lbs.	lbs.	m.p.h.	m.p.h.	ft.	
Transports														
Max Holste MH 1521 *Broussard*	F	Pratt & Whitney R-985	450	—	45 1.25	28 2.5	273.4	3,210	5,195	—	168	133	19,690	500–750
Hurel-Dubois HD 31[1]	F	Wright R-1300	2 × 800	—	147 8	72 2.25	1,076.4	19,290	29,760	5,500–8,800	—	180	21,980	950–1,250
Nord 2501 *Noratlas*[2]	F	Bristol *Hercules 758*	2 × 2,040	—	106 7.5	72 0.5	1,089.3	26,030	43,200	16,500	273	210	24,600	950–2,600
SO 30 P *Bretagne*[3]	F	Pratt & Whitney R-2800-CA.18	2 × 2,400	—	88 3	62 2	927.8	30,200–30,870	42,100–44,300	8,160–9,260	310	260+	23,000+	950–1,250
Fairchild C-119C *Flying Boxcar*	USA	Pratt & Whitney R-4360-20.W	2 × 3,500	—	109 3	86 6	1,447	39,800	6,400[4]	21,500	290	—	25,000	1,550–2,500
Bréguet 763 *Deux Ponts*	F	Pratt & Whitney R-2800-CA.18	4 × 2,400	—	140 11	94 11.25	1,995.6	70,550	110,230[5]	24,250–35,270	—	250	—	1,250–2,500
SE 2010 *Armagnac*	F	Pratt & Whitney R-4360-B.13	4 × 3,500	—	160 7	130 0.25	2,540	99,030	170,860	38,580	330	280	—	3,000+
Fokker F.27 *Friendship*	H	Rolls-Royce *Dart RDa.3* or Wright R-1820	2 × 1,400 or 2 × 1,525	— +365	95	65 5	754	19,995–21,845[6]	31,400–31,950	—	252–274	235–250	25,100–33,500	appr. 800+
Bristol *Britannia 300*	GB	Bristol *Proteus 755*	4 × 4,150 e.s.h.p.	—	140	124 3	2,055	—	155,000	30,000	—	389	—	3,500+
SE 210 *Caravelle*	F	Rolls-Royce (Hispano) *Avon RA.16*	—	2 × 9,000	112 6.5	103 4.25	1,571	41,900	82,000–84,700	17,640	—	465	33,000+	2,300–2,500
Hurel-Dubois HD 45	F	Rolls-Royce (Hispano) *Avon RA.16*	—	2 × 9,000	147 8	98 5	1,184	45,745	90,400–94,800	17,640–22,050	—	440	33,000+	—
Avro *Atlantic*	GB	4 Bristol *Olympus*	—	—	appr. 121	145	—	—	appr. 200,000	appr. 45,000	—	appr. 600	appr. 40,000	—
Personal aircraft and trainers														
Nord NC 856 A[7]	F	SNECMA 4 L 04	145	—	39 6	25 3	181	1,430	1,950–2,200	—	118	—	—	1–3 h
Saab-91 B *Safir*	S	Lycoming 0-435-A	190	—	34 9	25 9.5	146	1,580	2,310–2,560	—	171	155	18,000	appr. 620
Morane-Saulnier MS 733 *Alcyon*[8]	F	Potez 6 D 00	235	—	37 0.5	30 7.75	—	2,780	3,680	—	160	143	15,750	2.5–4 h
Piaggio P.136 L	I	Lycoming GO-435-C2	2 × 260[9]	—	44 4.75	35 5.25	268	3,900	5,730	—	176	160	18,000	435–750
Fiat G.49	I	Alvis *Leonides* 502/4 or P&W R-1340	550 or 600	—	42 8	31 2 / 31 9	262	—	6,300	—	230	—	23,000	900–1,250 miles
Macchi MB.323	I	Pratt & Whitney R-1340	600	—	39 4.5	29 11.9	217	4,410	5,710	—	240	—	21,300	800
SIPA S.200 *Minijet*[10]	F	Turboméca *Palas II*	—	350	23	17	97	950	1,675	—	250	—	—	340–460
Morane-Saulnier MS 755 *Fleuret*	F	Turboméca *Marboré II*	—	2 × 880	31 7.5	31 9.9	194	4,245–4,270[11]	5,895–6,140[11]	—	485[12]	—	40,000	560–1,000 miles
Fouga CM.170-R *Magister*	F	Turboméca *Marboré II*	—	2 × 880	37 0.8	32 1.75	186.2	4,590–4,755	6,100–6,980	—	440	—	34,450	560–750
Fiat C.80	I	De Havilland *Goblin* 35	—	3,500	39 3	41 10	270.6	—	12,570	—	535	—	42,650	900
Fighters and ground attack aircraft														
Potez 75	F	Potez 8 D 32	445 h.p.	—	42 8	29 10	—	3,690	5,290	—	—	150	—	465
SE *Sea Venom*[13]	F	De Havilland *Ghost*	—	5,000	41 8	35 3.25	280	—	—	—	—	—	—	—
SE 53 *Mistral*	F	Hispano *Nene*	—	5,000+	38	30 9	—	—	10,800	—	570	—	42,650+	870–1,100
Dassault MD 454 *Mystère IV*	F	Hispano *Tay*[14]	—	7,720+	appr. 33.5	appr. 41	—	—	appr. 17,500	—	appr. Mach 1	—	—	1+h
Republic F-84E *Thunderjet*	USA	Allison J-35-A-17	—	5,000	36	38	260	appr. 11,000	appr. 18,000	—	600+	—	40,000+	950–1,250
North American F-86E *Sabre*	USA	General Electric J-47-GE-13	—	5,300	37 1	37 6	appr. 290	10,950	appr. 18,000	—	695	—	45,000+	950–1,250
Hawker *Hunter 2*	GB	Armstrong-Siddeley *Sapphire*	—	8,300+	33.7	45.2	appr. 300	—	—	—	Mach 1+	—	—	—
Vickers-Supermarine *Swift 4*	GB	Rolls-Royce *Avon RA.7R(?)*	—	9,500	32.3	41.6	—	—	—	—	Mach 1+	—	—	—
SO 9000 *Trident*	F	Rocket engine + 2 *Marboré*	—	—	—	—	—	—	—	—	—	—	—	—
SE 5000 *Baroudeur*	F	SNECMA-ATAR 101	—	—	32.8	44.3	—	—	appr. 11,000	—	—	—	—	—
SE *Durandal*	F	1 turbojet	—	—	—	—	—	—	—	—	Mach 1.4+	—	—	—
Bréguet 960 *Vultur*	F	Hispano *Nene* + A.S. *Mamba 3*	1,325+	5,000	54 8	43 9.5	393.4	—	21,600	—	530–560[15]	—	42,650	1–4.5 h
SE 2410 *Grognard I*[16]	F	Hispano *Nene*	—	2 × 5,000	44 6.5	50 7.75	496.7	24,500	appr. 40,000	—	650	—	—	—
SO 4050 *Vautour*	F	SNECMA-ATAR 101C	—	2 × 6,170	—	—	—	—	—	—	Mach 1	—	—	—
Rotary-wing aircraft														
SE 3120 *Alouette*	F	Salmson 9 NH	200 h.p.	—	38 0.75	34 3.5	—	1,650	2,750	—	78	—	11,800–13,100[17]	2.15 h
SE S-55 *Eléphant Joyeux*[18]	F	Pratt & Whitney R-1340	600 h.p.	—	53	41 8.5	—	4,950	6,830	—	105	—	12,950[19]	450 miles
SE 311 *Hélibus*	F	Turbo engines	4 × 395	—	—	55 3	—	—	—	—	—	137	—	—
SO 1220 *Djinn*	F	Turboméca *Palouste*	—	—	—	—	—	—	appr. 1,100	—	—	appr. 60	appr. 3,300	appr. ¾ h
SO 1310 *Farfadet*[21]	F	1 × Turboméca *Arrius II* + 1 × Turboméca *Artouste II*	ea. 355 h.p.	—	36 9	—	—	—	—	—	—	150	—	250
Bristol 171 Mk.4	GB	Alvis *Leonides LE.23.HMV*	525/545 h.p.	—	48 7	46 2	—	3,820–4,110[22]	5,300–5,400[22]	—	120	—	16,000[23]	265–370
Bristol 173 Mk.3	GB	Alvis *Leonides Major*[24]	2 × 850 h.p.	—	48 6.5	55 2.5	—	9,300	13,500	—	150+	—	15,000[25]	180+

[1] Production version HD 32 (for 40 passengers) with two 1,200 h.p. P&W engines for a payload of 5 to 6.7 tons. [2] Civil version for 40 passengers : range 2,600 miles with auxiliary fuel. [3] Version A with R-2800-B.43 ; SO 30 P with two SNCASO-Turboméca *Palas* auxiliary jets shown in Paris. [4] Gross weight with overload 74,000 lbs. [5] Later to be certificated for 114,600 lbs. [6] Depending on power plant and equipment. [7] Several versions : artillery observation, agricultural use, communications services, touring etc. [8] MS 735 with Potez 6 D 30 of 300 h.p. recently began testing. [9] Earlier P.136 version with two 215 h.p. Franklin engines. [10] S.200-02 with bigger wing area, slightly longer cabin and modified equipment adapted for military use. [11] Depending on mission and equipment ; max. gross weight 6,670 lbs. [12] Permissible top speed 530 m.p.h. at 19,700 ft. = Mach 0.75. [13] De Havilland licence. [14] Some *Mystère IVs* are fitted with SNECMA-ATAR 101s ; *Mystère IVB* to have Hispano *Avon*. [15] Max. speed only with A.S. *Mamba* 250 m.p.h. [16] SE 2415 *Grognard II* slightly larger, but lighter ; smaller wing sweep. [17] Hovering altitude 4,260 ft. [18] Sikorsky licence. [19] Hovering altitude 7,870 ft. [20] Hovering altitude. [21] Compound aircraft. [22] Depending on mission. [23] Hovering altitude 7,400 to 10,500 ft. (latter with ground effect). [24] Planned for installation. [25] Hovering altitude 7,400 ft.

SNCASE (France) : Model of the *Durandal*, a light interceptor with delta wing and jet power, projected for 1955. Speeds of up to Mach 1.4 are expected.

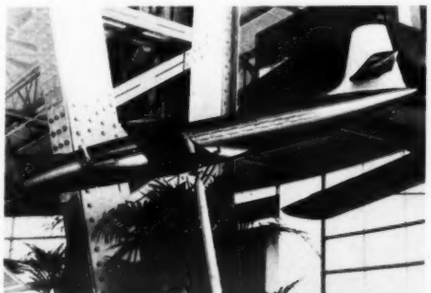


SNCA du Nord (France) : Model of the 40-passenger version of the Nord 2501 *Noratlas* freighter. Fitted with two 2,040 h.p. Bristol-SNECMA Hercules 758s, the *Noratlas* combines the take-off and landing qualities of a Douglas DC-3 with the transport performance of a DC-4. Above the model, the full-size Nord NC 856 multi-purpose aircraft, which is in production for the French Army (as artillery observation post).

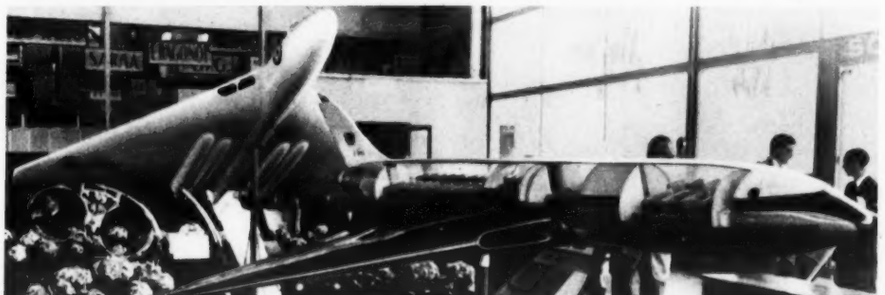
prototypes, namely the Sud-Ouest SO 4050 *Vautour* fast bomber, the SO 9000 *Trident* supersonic fighter, the Dassault *Mystère II* and *Mystère IV* interceptors, the Sud-Est SE 5000 *Baroudeur* light interceptor, the *Hurel-Dubois HD 31* narrow-wing commercial transport, the Nord 2501 *Noratlas* passenger and cargo transport, the Morane-Saulnier MS 755 *Fleuret,* Fouga CM 170-R *Magister* and SIPA S 200 *Minijet* fighter trainers, the *Potez 75* ground attack aircraft, and the Holste MH 1521 *Broussard* tourer. Then there were the SO 1220 *Djinn,* SO 1310 *Farfadet* and SE 3120 *Alouette* helicopters.

Besides these the visitor also came upon "old acquaintances" from earlier years, that have meanwhile *proved their worth in practice,* such as

SNCASE (France) : G. Héreil, the company's Chairman, explaining the take-off of the SE 5000 *Baroudeur* light intercepter and ground attack aircraft to a group of French Air Force officers (third from left : Colonel Cressaty, Air Adjutant to the French President). Using a take-off trolley driven by four to six rockets (and fitted with low-pressure tyres), it can take off even from make-shift airstrips. It lands on skids and is hoisted back on to the trolley by means of a jeep and a winch.

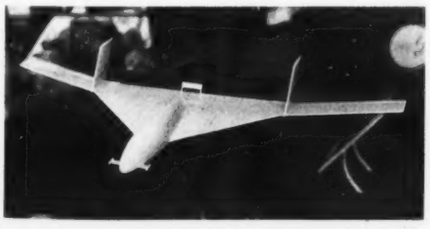


Costruzioni Aeronautiche Giovanni Agusta (Italy) : Model of the Agusta-Zappata AZ-1 turboprop airliner for 50 passengers.



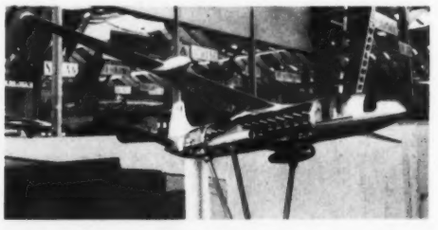
A.V. Roe & Co. (Great Britain) : One of the two large deltas shown in model form, the *Vulcan* four-jet bomber (background) has been flight testing for the past year. The much larger *Atlantic* transport for 76 to 131 passengers (foreground) is to be derived from the bomber and to have four Bristol *Olympus* turbojets. Projected cruising speed roughly 600 m.p.h.

Air Service Training (Great Britain) : Model of a high-speed target aircraft with fixed undercarriage (main wheels under the fins).



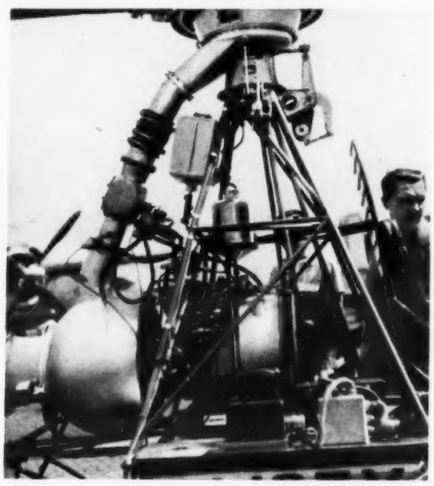
SNCASE (France) : Picture of the SE 210 *Caravelle* twin-jet airliner for 70 passengers, now under construction. Cruising speed at 36,000 ft. ; approx. 465 m.p.h. ; block distances up to 1,550 miles for a payload of 7 tons.

Hurel-Dubois (France) : Model of the HD 45 twin-jet commercial transport for 80 passengers ; cruising speed of 440 m.p.h. ; block distances up to 1,860 miles ; payload 8 tons.

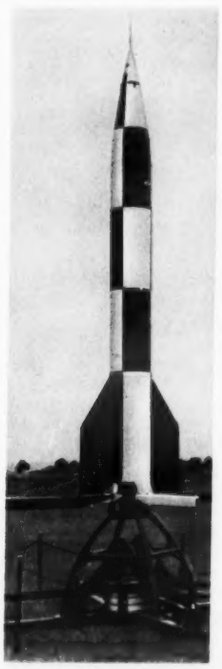


Paris Panorama

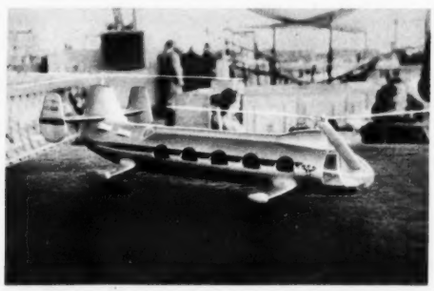
SNCASE (France) : In addition to helicopters of its own design, such as the SE 3120 *Alouette* (left), SNCASE also has a licence to build the 10-seat Sikorsky S-55, which has been dubbed the "Eléphant Joyeux" (Joyful Elephant) in France (right).



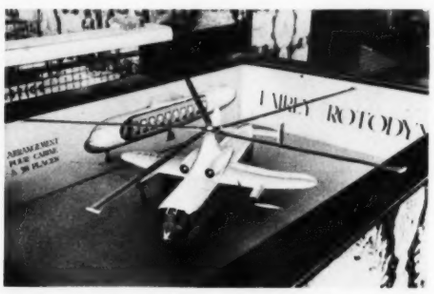
SNCASO (France) : SO 1220 *Djinn* experimental helicopter with new-type compressed air jet drive at the wing tips. Right, the Turboméca *Palas* turbo-compressor, the helicopter's source of power.



Laboratoire de Recherches Balistiques et Aérodynamiques and SNCASE (France) : Véronique experimental bi-propellant rocket (nitric acid and gas oil) for 8,800 lbs. thrust ; take-off weight 2,200 lbs. ; instrument weight 130 lbs. ; length 20 ft. ; calibre 21.7 ins. ; combustion duration 35 seconds. Next to it the model of a SNCASE anti-aircraft rocket.



SNCASE (France) : Model of the 30-seat SE 311 *Hélibus* transport helicopter ; power supplied by four 395 h.p. gas turbines.



Fairey (Great Britain) : Project for the *Rotodyne* compound aircraft for 38 passengers, probably with propeller turbine (two Napier *Elands*).

Bristol (Great Britain) : The five-seat Bristol 171 *Sycamore*.

the Sud-Est SE 2010 *Armagnac* and Bréguet 763 *Deux Ponts* (now renamed the *Provence*) heavy four-engined commercial transports, the Sud-Ouest SE 30 P *Bretagne* twin-engined medium-range transport, and others. Finally there was a series of older military aircraft to be seen—some of them "long-service" experimental models, others production versions—and even a number of sports aircraft. Instead of merely listing type names, we have included all these aircraft in a table giving latest characteristics and performance figures.

The *non-French contribution* to the Show—except in the flying displays—was a relatively modest one. Strongest participant was the *American industry*, which showed the Republic F-84 *Thunderjet* and North American F-86 *Sabre* (Royal Canadian Air Force model built under licence by Canadair), the Douglas B-26 *Invader* ground attack aircraft, the Fairchild C-119 *Flying Boxcar* transport, the Grumman SA-16 *Albatross* sea rescue and communications amphibian, the Cessna 180 and 195 personal aircraft and the Bell 47D, Hiller 360 and Sikorsky S-55 helicopters. The expected Italian trainers (and sports aircraft) unfortunately did not turn up, but Sweden was represented at least by the Saab *Safir*. Finally the *British aircraft industry* showed the English Electric *Canberra Mark II* jet bomber, the Short *Sealand* touring and commercial transport and the Bristol 171 *Sycamore* helicopter. A series of models of existing aircraft rounded off the picture, while Air France, demonstrating its new air fleet, showed a Vickers *Viscount* and a de Havilland *Comet* of British make, as well as the first of its new Lockheed *Super Constellations*. A *Comet* was also shown by Union Aéromaritime de Transport (U.A.T.).

Among the *projects* there was again no lack of new ideas and proposals. For example, there were "swarms" of delta-wing aircraft . . . in pictures or model form. (Only the Avro 707 was demonstrated in flight.) The collection of future turbojet and turboprop commercial aircraft (for 40 to 130 passengers) and of large commercial helicopters and compound aircraft (for 30 to 40 passengers) was scarcely less varied. Of special interest were models of *Hurel-Dubois'* much-discussed *HD 45 jet commercial transport* (France), a strut-braced shoulder-wing monoplane of high aspect ratio, and its rival, *SNCASE's SE 210 Caravelle* (France), which follows more traditional design principles, obviously influenced by de Havilland, but carries its turbojets in the fuselage rear. Finally, mention should be made of the projected Fokker F.27 *Friendship* (Holland) and *Agusta-Zappata AZ.1* (Italy) turboprop airliners, only the former of which however is likely to fly anywhere in the near future. Two F.27s are to be built ; they can be fitted with piston engines instead of propeller turbines and are to go to KLM for operational testing.

Igor Sikorsky and Interavia

The words "Sikorsky" and "helicopter" have become almost synonymous. Igor I. Sikorsky, Engineering Manager of the Sikorsky Aircraft Division of United Aircraft Corporation enjoys an international reputation. Personal impression : unassuming friendliness, a lively interest in everything, a man who knows where he is going. Hobby : photographing volcanic eruptions from a helicopter.

Our editor E. B. had a brief conversation with him at the Paris Air Show.

". . . So you are Swiss ? I've been wanting to go and see your mountains again for a long time, perhaps to Interlaken, Grindelwald or Mürren. I quite fell in love with Zermatt, too, on my last trip. But the train journey is so long ! Even if you fly to Geneva or Zurich, you waste an awful lot of time afterwards on your Federal Railways, fine and modern as they are. It would be much easier and quicker to get there by helicopter."

Sikorsky then went on to talk about the future of rotary-wing aircraft, coming back to talk about Switzerland, which, with its many small towns in the foothills of the Alps, would be ideal country for helicopter operations.

Domestic air services inside Switzerland by conventional fixed-wing aircraft are scarcely practicable, as distances are much too short for real advantage to be taken of the increasingly superior speed of aircraft over road or rail transport. But what a wonderful field for helicopter feeder services from the three main airports—Geneva, Zurich, Basle—to the country's larger towns and many holiday resorts !

Our editor mentioned the recently-founded Swiss Helicopter Co., of Berne, which is investigating the military and civil uses of the helicopter in Switzerland. Sikorsky had heard of this company, he said, and was following its activity with interest. However, it should not confine its investigations to small helicopters, but also look at larger models.

Sikorsky is as convinced as ever that future rotary-wing craft must have accommodation for 50 or more passengers, and that gross weights of up to 50 tons are quite within the realms of possibility. Asked about flight performance, he replied in very definite terms : the present top speed of around 120 m.p.h. could be increased by another 60 m.p.h. Speeds between 180 and 240 m.p.h., however, would be the province of the compound aircraft, whilst the convertiplane would probably be the best solution for speeds above the latter figure. Adequate power reserves, the use of turbine engines and the single-rotor configuration are in Sikorsky's view basic principles which must be borne in mind in the development of future rotary-wing models. He closed with the words : "I am convinced that rotary-wing aircraft will soon play just as important a part in civil aviation as they do today in the military field. In a few years' time new types will be coming on to the market, which will meet in full the requirements of air transport. Then we shall ask ourselves with surprise how we ever managed so long without helicopters . . ."

But now a brief handshake. Somewhere in the background a young journalist colleague from Washington is hovering with pencil poised on notebook . . .

Modern production methods at the Show : A *Sciaky* (France—USA) electric seam-welding machine, with, in front, a spot-welded outboard tank made by *Société d'Etudes et de Constructions Aéronavales, SECAN* (France).

The official stands : left, *stand of the Centre d'Essais en Vol*, the Government organization which flight tests all French aircraft types. Main establishment at Brétigny-sur-Orge, branches at Marseilles-Marignane, Istres, Casaux, Villacoublay and Toulouse. Right, stand of the Secretariat General for Civil and Commercial Aviation.

Modern production methods

Production engineers also came into their own this time. *Armstrong-Whitworth* (Great Britain) showed the "last word" in "integrally-stiffened" tailplane skins for a high-speed aircraft (very high, but apparently unavoidable production costs). *Bréguet* (France) went to the other extreme in its concrete wing for a guided missile. Société *Sciaky* (France, USA, Great Britain) demonstrated its electrical spot and seam welding machines (for 70,000 to 80,000 Amp. peak current and 4,400 lbs. electrode pressure), producing an electrically spot-welded outboard fuel tank made by *SECAN* (France) as a practical example (picture).

Last but not least, *SNCASO's* (France) weight-saving *bonding method*—metal to wood, or metal to metal, and *Fokker's* (Holland) *metal bonding process* deservedly attracted the attention of the experts. Convincing proof, in the shape of numerous examples, was provided by Fokker of the superiority of this revolutionary method of production over riveting. Fokker (i.e. the Fokker-Eckold company) also showed a new universal metal sheet shaper for prototype and small series production.

Research, experiments, French armed services

Our review would be incomplete without a brief mention of the "official" stands at the Paris Show. The only one of the Government corporations which is autonomous is ONERA, the research organization. The testing establishments all come under the Secretariat of State of Air. Then there was the Air Force and the Naval Air Arm.

ONERA (Office National d'Etudes et de Recherches Aéronautiques), a corporation under common law, offered extensive samples of the achievements of its five divisions : aerodynamics, engines, structural materials, statics, general physics.—Of particular interest : a new type supersonic wind tunnel for continuous variable Mach number, shown in model form. Details of this establishment can be found in the report by Maurice Roy, director of ONERA, which recently appeared in these pages (No. 7/1953).

The *CEV (Centre d'Essais en Vol = Flight Test Centre)*, which as the central authority for acceptance testing of all French civil and military aircraft types plays a decisive part in all French aeronautical development, was able to give only a partial idea of its activity, with a collection of measuring instruments for use in flight (picture). A far more impressive proof of CEV's work was the quality of the flying equipment. The same applies to the two other Government test centres, the *CEMH (Centre d'Essais des Moteurs et des Hélices* = Engine and Propeller Test Centre) and *DTI (Direction Technique et Industrielle de l'Aéronautique* = Technical and Industrial Directorate). The former's exhibits included the model of a high-altitude test bench for aircraft power plants (up to 5,000 h.p.; altitudes up to 56,750 ft.) at *Saclay*, whilst DTI showed a model of the *Palaiseau* radio laboratory.

The official stands : The information desk of the French Secretariat General for Aviation with, behind it, a collection of pictures from the Aviation Museum.

The *French Air Force* showed a series of "stage sets" to illustrate the duties of its specialists. Today only 5 to 10 percent of the personnel of any air force are pilots, but more and more trained mechanics, radio mechanics, administrative staff for evaluation centres and operations rooms are required. The Air Force had organized its show, which included the model of a modern air defence system with radar observer network and underground command post, to attract recruits for these services and perhaps with an eye on the puzzled taxpayer.

Needless to say, the *French Navy* (including the Naval Air Arm) could not let slip this opportunity to attract public interest and canvass for recruits. Guided missiles gleamed above the sailor's decorative halberds, 14 to 17-year olds were invited to test their skill with the twin machine guns . . . Also a de Havilland *Sea Venom* (built under licence by SNCASE), parts of the *Véronique* research rocket, and the three-dimensional lay-out of an anti-submarine defence system using sono-buoys and anti-submarine aircraft.

Finally we must not forget the *Musée de l'Air* (Paris Air Museum), which recalled great names in aviation history with four scale models of historical aircraft and a large collection of photographs. A long time has gone past since the first balloon ascents (1782) and parachute jumps (1785), but it is scarcely creditable that it is not yet a full 50 years since the Wright Brothers made their first flight (December 1903). A branch of engineering which occupied the leisure hours of but a handful of men five decades ago now gives employment to 60,000 men and women in France alone . . .

The New Airport Terminal

It has cost the Swiss Federal Government, the Canton and City of Zurich, the City of Winterthur and the *Flughafen-Immobilien-Gesellschaft* (Airport Real Estate Company) roughly 110 million Swiss francs (nearly $26,000,000) to build Zurich-Kloten Intercontinental Airport on the marshy ground of a former artillery range. Even for a wealthy canton like Zurich, this is a lot of money. It speaks highly of the Government's far-sightedness and the people of Zurich's progressiveness that such a major project could be planned so early and put into effect in so short a time.[1] A detailed report on planning and construction of the runways and taxi-ways, the radio-electric installations for air traffic control and the lighting and signals installations was published in these pages five years ago.[2]

[1] Federal decision of June 22nd, 1945 ; Zurich referendum of May 5th, 1946 ; West runway (QFU 10/28 ; 1,900 × 60 m) opened on June 14th, 1948 ; instrument landing runway (QFU 16/34 ; 2,600 × 75 m) opened on November 17th, 1948 ; terminal building opened on April 9th, 1953.

[2] *Interavia*, Review of World Aviation, No. 6/1948, pp. 319-332.

Project drawing of the south front of the terminal building (September 1950 ; architects A. and H. Oeschger, Zurich) with the two bus ramps for arrivals (1) and departures (2), passenger wing (3), restaurant wing (4), spectators' terrace (5), lawns (6) and tarmac (7). The basement (8) of the passenger wing is also accessible to road vehicles.

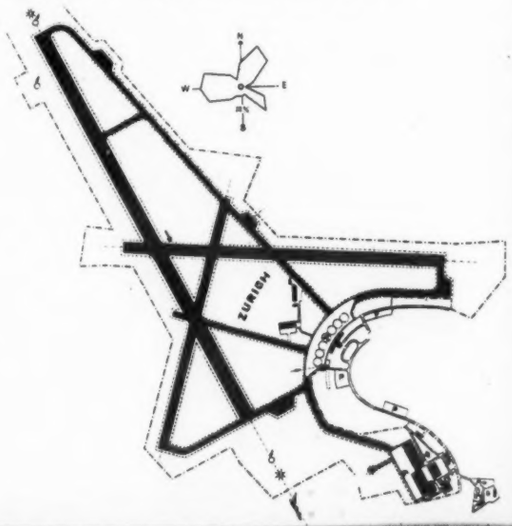
Out of the total sum mentioned above, roughly 24 million francs have so far been spent on *buildings*, namely hangars and workshops, central heating plant and transformer station, various secondary buildings and, last but not least, the actual *terminal building* which alone has cost nearly 12 million francs. A mail and freight dispatch building and a hangar for private aircraft are still to be built. Construction and operation of these buildings are in the hands of *Flughafen-Immobilien-Gesellschaft Zurich* (F.I.G. : Chairman : Heinrich Hürlimann), non-profit-making mixed private-Government enterprise.

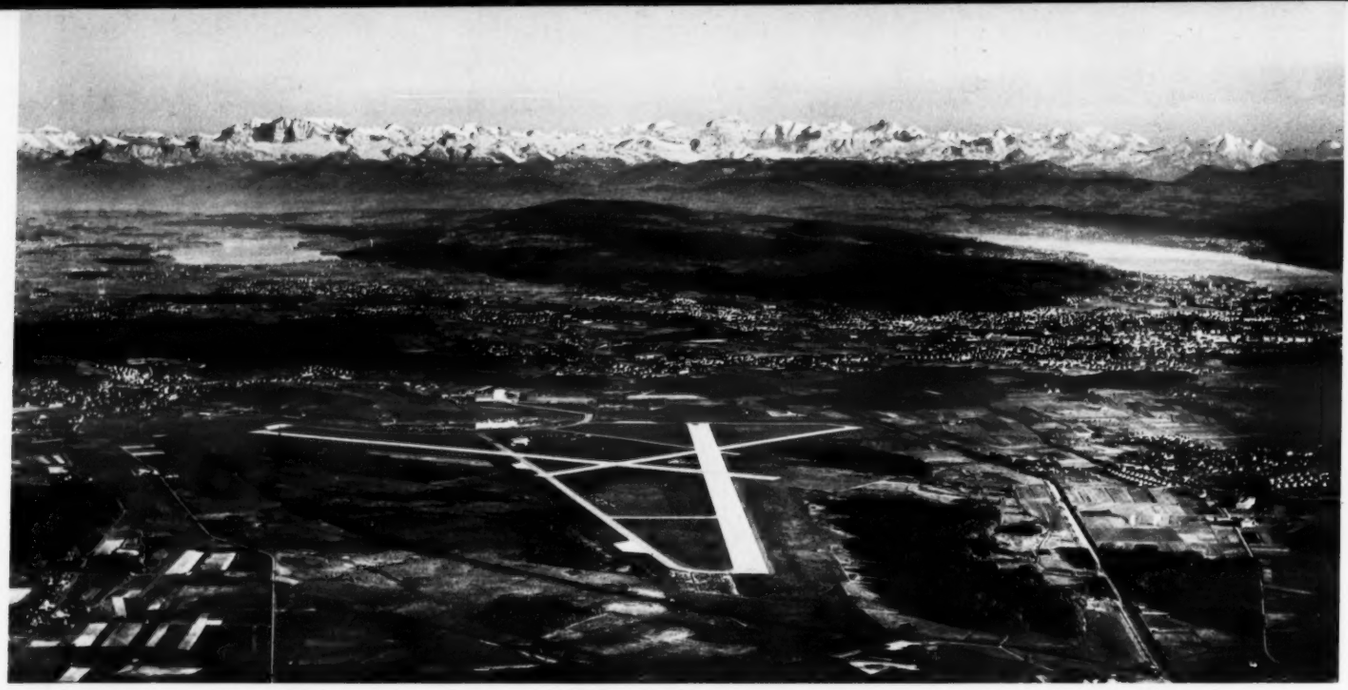
A new word, "Flughof" (air station), formed on analogy with the familiar "Bahnhof" (railway station), has been used in German for Kloten's new terminal building. The old word "Abfertigungsgebäude"—dispatch building—would have been quite inadequate for this elegant and spacious structure, designed by Architects *Alfred and Heinrich Oeschger* and Building Engineer *Dr. G. Kruck*. "Dispatch building" would be an understatement, almost an insult to F.I.G. and thus to the Zurich Cantonal Building Directorate, its head *Dr. P. Meierhans* and air transport delegate *Dr. E. Altdorfer*. Nobody is to be "dispatched" any more at Zurich—either passengers or their escorts. Instead they are to be given courteous individual attention, with the quiet efficiency which marks good hotel service. *This attitude towards the client is expressed most forcibly in the building's architecture.*

The airport as link between home and world

We agree entirely with Gerhard Kühne, Berlin architect and occasional contributor to

Runway system at Zurich-Kloten airport : three take-off and landing runways ; five taxi-ways ; terminal building and tarmac in the centre of the bend (south-east) ; hangar and workshop at extreme south-east end.





While still in flight the passenger is wooed by the snow-capped Alpine ranges, Lake Zurich and Zwingli's smiling city . . . a broad runway receives the aircraft.

Aircraft taxi right up to the passenger wing, so that passengers step almost straight inside. The terrace above protects from rain.

Interavia, when he states that an airport is not a mere technical problem of design, but must facilitate the sudden transition from one climate, scenery and culture to another which air travel involves.[3] Finally the airport is a point of contact not only with the third dimension, but also with the fourth, the dimension of time. *The passenger arriving full of the impressions of his flight must be led gently back to earth and prepared for his surroundings.*

This task may be said to have been admirably accomplished at Zurich's "air station." While still in flight, the passenger's attention is wooed —if the weather is kind—by the snow-capped Alpine ranges, sparkling Lake Zurich, Zwingli's smiling city . . . and then just below him, the

[3] *Bauwelt (Berlin),* June 29th, 1953, p. 510 et seq.; cf. also "Helicopter Terminals" in *Interavia,* No. 11/1952, p. 644 et seq.

A brief interlude in the Customs hall, which has purposely been designed for sober efficiency, for rapid handling of baggage.

The passenger steps into an atmosphere of freedom . . . comfortable chairs, flowers, waiting friends. The bus waits outside the exit.

airport. A broad runway receives the aircraft, and the terminal building, with its 95-ft. high control tower—in itself a symbol of security—awaits the passenger. Green lawns, flags, people. Formalities are quickly disposed of, without long route marches by the passengers or the clambering in and out of a bus to be driven a few yards. Aircraft taxi right up to the passenger wing, so that travellers can step almost straight inside. A brief interlude in the Customs hall—purposely designed for sober efficiency, to ensure fastest possible handling of passenger's baggage—and the traveller passes through broad glass doors into an atmosphere of space and freedom . . . to comfortable chairs, flowers, welcoming friends, buses waiting under the covered exit.

For travellers in the other direction too, from the confines of the city to the wide horizons of the world beyond, the airport's architecture provides a kind of psychological preparation. Passengers and their friends now enter the terminal building on its *upper floor,* as buses from the town drive up a 14-ft. ramp. The trapezoidal *main hall* receives the arriving visitor and *draws* him irresistibly towards the five great windows (23 × 23 ft.) looking on to the airfield, just above the area where passengers board their planes for European or more distant destinations. The panorama, already impressive, will be broader still when the two older hangars are dismantled. The spectators' terrace in front of the building is on a lower level, on the principle of the amphitheatre, and does not hamper visibility.

Here, in this large, light hall, which with its white marble floor and handsome overhead light gives the impression of being higher than

From the confines of the city to the wide horizons of the world beyond: the main hall (on the upper floor) receives the new arrival and draws him irresistibly towards the 115 ft. window front.

The eye ranges far and wide over the airfield and finally comes to rest on the busy activity on the tarmac. The spectators' terrace in front is on a lower level, so does not hamper visibility.

Anybody who is hungry or thirsty has the choice of a number of bars, cafés, or the main restaurant. Here the entrance to the restaurant.

After passing through passport and Customs formalities, the passenger goes into a large, light waiting room, which looks higher than it really is. In the rear, the well-supplied snack bar.

it actually is, the traveller says goodbye to his friends. He walks downstairs—or takes the lift—to the ground floor, shows his passport at the barrier and finds his luggage arranged on the counters in the central Customs hall. Formalities are brief and painless (particularly for departing passengers), and then comes another large light hall, again appearing higher than it is, the central *waiting room* for all services leaving Zurich. Here he meets transit passengers from all countries and of all tongues : Americans on their way to Cairo, Air France or BEA passengers for Vienna, Scandinavians en route for the sunny south, South Africa or the Far East.

Anyone who is hungry or thirsty can choose between several bars and cafés, or go the main restaurant (on the Swiss side of the Customs) with its conference rooms, etc. There are also darkened rest rooms, baths and washroom, and even a changing table for babies with trained child nurse in attendance. Comfortable chairs and flowers give the waiting and refreshment rooms a hospitable air. Thanks to excellent sound-proofing of walls and ceiling, the building is quiet, even when activity on the tarmac is at its height. The public address system calling passengers to their aircraft thus sound almost attractive. Passengers are assembled in one of the two smaller rooms adjacent to the main waiting room and conducted under the spectators' terrace—sheltered from wind and rain—to the aircraft.

Au revoir, Zurich . . .

Efficiency the watch-word

Like every great work, Zurich air station was born in woe. Its final form is the result of

Architect Alfred Oeschger, who died on February 15th, 1953.

Architect Heinrich Oeschger, Zurich.

Heinrich Hürlimann, Chairman of the Flughafen-Immobilien-Gesellschaft Zurich.

24 detailed projects. Ultimately the architectural beauty of the building would be valueless if the basic problems of technical efficiency were not satisfactorily solved.

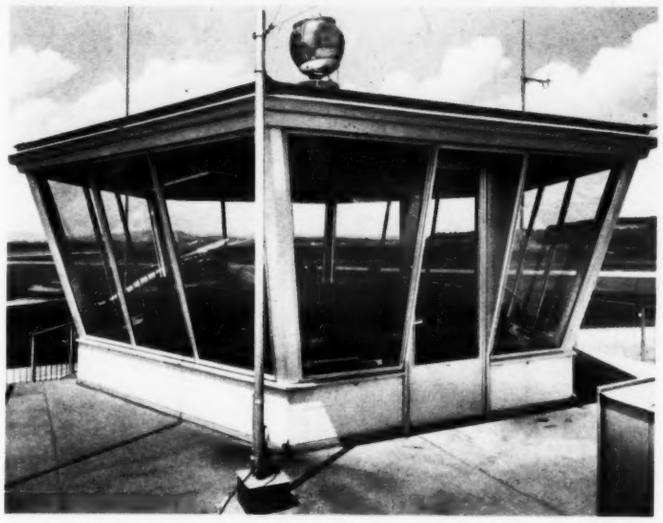
That this principle was clearly recognized is shown by the division of the building into *three* main wings, the central *passenger wing* (whose axis runs at right angles to the tarmac), the *office wing* with control tower (north wing with axis parallel to tarmac), and *restaurant wing* (south wing).—*Passenger services are spread over three storeys,* each of them accessible to road vehicles. The *top floor* is for out-going passengers, the *ground floor* for incoming passengers and the *basement* for baggage. Completely separated from the passenger wing and the offices—but with access to the restaurant—runs the 650 by 13 ft. *spectators' terrace* on a level a little below that of the top floor. This also protects passengers from the inclemencies of the weather on their way to and from the aircraft.

Incoming passengers cannot mingle with out-going passengers, and neither group with the spectators. On the other hand passengers are not separated according to their flight numbers until shortly before departure, so that they can move about freely up to the last moment. Only crews have access to the office wing, with its flight dispatch, meteorological and operations services. Finally special roads and entrances have been made to the *basement* for the baggage service and maintenance personnel, and the rest of the airport staff also use separate entrances from the passengers.

Baggage is handled equally efficiently. That of out-going passengers goes—separately but in full view of its owners—to the counters in the main hall, then via three lifts to the Customs hall at ground level and finally to the aircraft. In the opposite direction, incoming luggage passes through the Customs hall and straight—without lifts—to the city-bound bus ramp.

The original design of the terminal building has made full allowance for *future expansion.* Even in its present form it can already handle 1,500 outgoing and 1,500 incoming passengers an hour—which corresponds to maximum runway utilization, counting 50 to 75 passengers per aircraft—but nobody can yet forecast what increase in traffic volume the next twenty years may bring, what with growing tourist class traffic by large airliners, helicopter services and so on . . . Extensions have been planned as follows : transverse wings at the rear end of the passenger wings, and pro-

The elegant "double hump," or "camel bar" at the entrance to the restaurant ; beyond the main dining room for 170 guests.



The control tower, symbol of security, is a full seven storeys high. Double green-tinted windows, sound-proofing and temperature control create ideal working conditions.

View of the interior : in front, the control desk for the lighting system for runways and taxi-ways ; behind, the approach control desk ; right, the automatic R/T D/F equipment.

longation of the office wing northwards and the restaurant wing southwards, possibly also with transverse wings.

The railway connections required for these later stages of development have also been studied, especially a project for an *underground railway*. Finally a piece of ground has been set aside to the south of the restaurant wing for use by the "intercity" *helicopter* feeder services expected to be inaugurated in the not-too-distant future.

Visit to the control tower

The external form of the seven-storey control tower alone illustrates its vital part in air traffic control. A fast lift takes us to the sixth floor, from where a narrow staircase leads to the air-conditioned glassed-in control room above, with its non-dazzle slightly green-tinted double windows sloping inwards, broad control desks, cool atmosphere . . . and absolute quiet, broken only by the R/T messages from pilots touching the airport zone and the muted replies of the control officials.

The visitor is shown the equipment of this control room, in particular the control desk for the lighting installations, the approach control desk and the automatic R/T D/F equipment.

One of the most impressive parts is the lighting system. Remote controlled coloured lamps (along the take-off and landing runways, taxiways and approach paths) ensure safe operation at night. The instrument landing runway and its approach path are also lit by high-intensity lamps (of 300,000 candle-power each), which are switched on even in daytime in bad weather and which enable ILS approaches to be made down to the break-off height of 200 ft. fixed by the airport (height at which pilot must break off landing approach if he cannot clearly see the runway despite the chain of high-intensity lights). All these lamps are switched on from the control tower, and each is represented on the plan on the control desk by a small warning light.

Another interesting part of the equipment is the R/T D/F instrument with cathode ray tube, which gives the position of the aircraft with which control is in R/T communication. Either the aircraft's true bearing (QTE) or its magnetic course to reach the D/F aerial (QDM) is shown on the scope. Pilots of course prefer the more convenient QDM value.

GCA radar is also to be installed in the control tower shortly, and the construction of a VOR beacon is planned.

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Leaving the control tower, the visitor again passes through the main hall, the air station's *pièce de résistance*, where the flags of the 14 airlines from all over the world which regularly serve Zurich can be seen. In a few weeks' time, on August 29th and 30th, the "last phase of the first building stage"—as the responsible Government Councillor Dr. Meierhans put it—will be completed by the official inaugural ceremony. This is to include a banquet for 470 invited guests, a social evening for 2,000 people, Alpine joy-rides, a flying display by modern aircraft of all kinds.

Bird's eye view of the "Flughof" : length 490 ft., built-up area 50,000 sq.ft., volume 2,500,000 cu.ft. ; ferro-concrete structure on 450 concrete pylons ; control tower of steel and light metal.

Dr. Warner Sums Up

Review of the Seventh Session of the ICAO Assembly

The *Seventh Session of the International Civil Aviation Organization Assembly* in Brighton, which was attended by representatives from 52 of the 60 member-States and from five non-member States and eight international organizations, closed on July 6th, 1953, after three weeks' work.

The Session was presided over by Sir Frederick Tymms, who has represented Britain on the ICAO Council since 1947.

The *three committees* were headed as follows: *Technical Committee,* Colonel Luis de Azcarraga (head of the Spanish delegation); *Economic Committee,* René Lemaire (head of the French delegation and Secretary-General of French Civil and Commercial Aviation); *Administrative Committee,* Brigadier-General C. S. Booth (Canada's representative on the ICAO Council).

The answer to the question of what the Session achieved depends on what it could reasonably have been expected to achieve. One newspaper report, for example, considers that the results were meagre. Apart from a quantity of useful detail work, no far-reaching decisions had been made. Opinions of this kind betray a lack of understanding on the part of the daily press of the nature of ICAO's tasks, which can only be accomplished by patient plodding over a number of years, and of its General Assembly, at which "sensations" can be expected only on rare occasions (unexpected admissions or—as has happened—exclusions of member States, conclusion of an agreement which chances to be ready for signature, or the like).

Those who did not expect spectacular events will have had their money's worth—perhaps even have been impressed by some of the reports and decisions of the meeting.

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Dr. Edward P. Warner, President of the ICAO Council—who incidentally only consented to remain in his office at the pressing request of other members of the Council—developed his 1952 report to the meeting into a comprehensive review of the whole post-war period.

He opened his remarks by quoting the list of tasks with which ICAO was entrusted at its foundation under the Chicago Convention of 1944.[1] These tasks can be divided into two main groups, one technical and the other economic:

Organization of a world-wide system of flying safety and establishment of the necessary standards;

Planning and practical encouragement of an economically sound growth in commercial aviation.

*

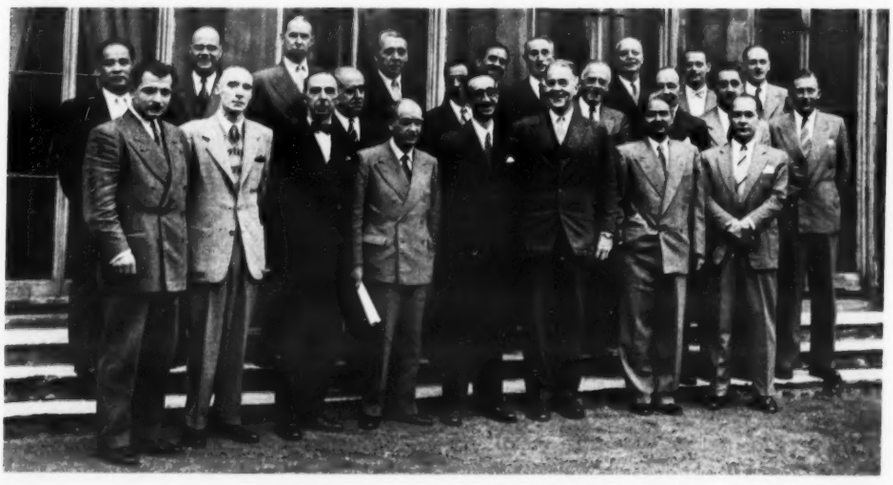
As regards the *first task, the technical one,* it could be said in Brighton without any exaggeration, that the fabric of the flying safety organization is now finished. The annexes to the Chicago Convention issued by ICAO laying down technical standards and recommended practices for member States are complete, so that all that now remains to be done is to supervise the application of ICAO decisions and the adoption of their principles by individual States. To aid in this work the meeting of the ICAO Council recommended that the five regional offices (Paris, Cairo, Lima, Melbourne and Montreal) be reinforced, to coordinate and facilitate the holding of regional conferences on individual technical questions.

In the field of *economic coordination* of world air transport the Organization's work so far has been more difficult and undeniably less successful. However, responsibility for this state of affairs does not lie with ICAO or its executive organs, but with the air policies of the majority of member-States, dominated as they are by national economic interests. This has meant that it has still not been possible to arrive at a multilateral agreement on "Fifth Freedom" rights. In spite of energetic efforts by a number of countries, including especially France and Holland, the final solution to this question will probably not be reached for a considerable time to come.

To prepare the way for world-wide agreement on this point, it is recommended that preparatory, partial solutions on a regional basis be found. In this connection the meeting took up a suggestion by the Council of Europe that a *European air transport conference* be called. The committee composed of representatives from Belgium, Denmark, France, Great Britain, Holland, Italy, Norway, Sweden and Switzerland, which is to meet in Paris on

[1] Objectives of ICAO, laid down in Article 44 of the Chicago Convention, are to 1) Insure the safe and orderly growth of international civil aviation throughout the world; b) Encourage the arts of aircraft design and operation for peaceful purposes; c) Encourage the development of airways, airports, and air navigation facilities for international civil aviation; d) Meet the needs of the peoples of the world for safe, regular, efficient and economical air transport; e) Prevent economic waste caused by unreasonable competition; f) Insure that the rights of contracting States are fully respected and that every contracting State has a fair opportunity to operate international airlines; g) Avoid discrimination between contracting States; h) Promote safety of flight in international air navigation; i) Promote generally the development of all aspects of international civil aeronautics.

President Warner and Secretary General Ljungberg among the 21 members of the ICAO Council, who are elected for a period of three years.



October 15th, has been entrusted with the task of preparing such a conference for the end of 1953 or beginning of 1954. An encouraging sign is the participation of Britain, despite the fact that she is not a member of the Council of Europe.

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On the subject of ICAO's *budget,* an earlier article *(Interavia,* No. 6/1953, p. 340) already reported that certain States, in particular the United States, were pressing for reductions in expenditure, notwithstanding ICAO's growing tasks. After lengthy discussion, the American delegation finally succeeded in obtaining cuts amounting to $36,666, which the Secretariat General now has to share out among the various budget items. The total 1954 budget is $3,200,000 (Canadian), compared with $3,259, 384 in 1953 . . . A sacrifice on the altar of the new American economy drive.

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The composition of the 21-nation *ICAO Council* has changed but little. The Lebanon replaces Iraq as representative of the Arab League. The Scandinavian countries, which take turn and turn about on the Council, have delegated Norway to speak for them in these highest councils of world civil aviation during the coming three-year period.

Nationalist China was readmitted to the Organization as the latest *member-State,* now that the question of her arrears of contributions has been settled amicably. As Yugoslavia has announced her intention of applying for membership in 1954 and the Venezuelan delegation promised early ratification of the Chicago Convention, ICAO should shortly number 64 States. Western Germany, who sent two observers for the first time, may also be admitted before long.

In one sector of world politics at any rate, that of international civil aviation, the realization appears to be gradually gaining ground that even the narrower interests of individual States can best be served by cooperation.

The Air Hostess Told Us...

Wow, said Esmeralda, I'm just back from Paris. Paris ? we asked, what did *you* do in Paris ? The air display ? Go away with your aeroplanes, answered our Favourite Air Hostess, I'm around aeroplanes all day—no, I've been collecting jokes, dozens of them, all of them true, because I got all of them from those proverbially truthful aircraft salesmen, mostly at the cocktail parties. In fact, cocktail parties seem to be designed chiefly for the spreading of jokes, mostly unprintable, but with a few straight ones in between.

For instance, you have an airline out there in Switzerland, Swissair I believe, she said. Well, air travel is my business and one of the things they taught me is how to try to keep the passengers amused, but in the entertainment line Swissair has everyone licked. Directly after the war one middle-aged lady passenger travelling to London aboard a DC-3 decided she would go to the rear of the cabin to powder her nose just before landing. Suddenly a piercing scream chilled the remaining twenty, the pilot went into a nose dive and nearly hit the trees. When the aircraft was back on an even keel, the stewardess rushed back and wrenched open the door to the toilet room—to discover the middle-aged lady frozen rigid in front of the mirror, green in the face, with a large, hairy ape's hand stroking the back of her neck. The monkey had escaped from his cage and discovered an opening connecting the cargo compartment with the powder room. The lady never travelled by air again.

Very funny-ha-ha, we said, let's have the next one.

You have no sense of humour, said Esmeralda, perhaps you'll like this one better, although it is strictly for *women only,* so you men had better stop reading this. The story begins in the days just after the Big Airlift, from which effort forward-looking lingerie manufacturers gained a few ideas. One of these ideas was incorporated in a device of *outstanding* aid to those who have been less liberally endowed in certain parts than could be wished. The article in question is air-inflated by a rubber tube system and proved so efficient that the manufacturers decided to send on a publicity tour one of their female employees who with the aid of the device had graduated from a 'dame' to a 'luscious dame'. Proudly wearing this adjunct the young lady boarded a trans-Atlantic aircraft, an unpressurized DC-4, and settled herself comfortably to sleep. However as the plane gained height, matters began to get a little out of proportion, in fact so much so that the unfortunate girl, not wishing to have to pay for the use of another seat, sought refuge in the pilot's cabin. The pilot was a most accommodating fellow, and removed from her vicinity all pins and other sharp-pointed articles which might prove a danger, until the time when the girl, by now wondering if she would ever see her feet again, felt a certain alleviation in the situation as the plane was losing height and the journey was nearly over.

Very funny, we said, funny-peculiar, but supposing the aircraft had climbed a little higher, would there have been a supersonic boom provoked by explosive decompression? Next joke, please.

I'll try to do better, replied Esmeralda, you sourpuss. This one happened only a few days ago.

A Puerto Rican bearing the very Spanish name of Juan Martinez and speaking only his native Spanish decided it was time to go back from New York to Puerto Rico. Accordingly he bought a ticket and travelled out to Idlewild Airport. He was given a boarding ticket which, as a result of a mistake, bore no flight number, and after waiting around for a while he was shepherded on to the aircraft.

What Señor Martinez did not know was that the flight was headed for Frankfurt, Germany. After a while the air hostess asked her passenger, in English, if he would care for a drink . . . to which he replied with his name, "Martinez." A minute later he was served with a dry Martini. To every question he answered "Martinez," and every time he got another dry Martini, until he staggered off the aircraft at rainy Gander, in Newfoundland. The rain saved Señor Martinez from the rest of the trans-Atlantic trip, for he felt that the air was a little chilly for Puerto Rico and began to make enquiries, all in Spanish, of course. The result was nevertheless that he was flown back to New York and thence to Puerto Rico, where he continues to marvel at the hospitality which the airlines extend to their passengers.

The last, we said, is a tall one, and probably it's your own invention. No, said Esmeralda—it was me who served him all those dry Martinis. I am now learning Spanish.

Noises off

Behind the German Civil Aviation Scene

There has been much speculation throughout the world press on the future of German aviation, in particular of German air transport. On the whole, however, these reports have been so confusing, with assumptions and statements of one day being denied the next, that a few views direct from Germany may help to give a clearer picture of the situation as it existed in mid-July.

In its issue for July 1st, 1953, for example, "Der Spiegel"—a German weekly magazine of high repute—made a very plain dig at the "activator of German air transport":

"Hans-Christoph Seebohm, 49, Federal Transport Minister, recently received a lesson in precedence from H. Mansfield Horner, Chairman of the Technical Assistance Board of the United Nations and President of America's biggest aircraft engine works (75% of world production). Asked at a press conference at Bonn's Hotel Bergischer Hof whether he intended to see Herr Seebohm, Horner replied : 'No, we only got one day for Bonn'."

Federal Transport Minister Seebohm thereupon retorted in the Federal Government's official Press Bulletin on July 2nd, as follows :

"H. M. Horner, Chairman of the United Nations Technical Assistance Board and allegedly President of the biggest American aircraft engine company, was quite right not to have sought contact with the Federal Transport Minister. The Federal Transport Minister is not responsible for building up aircraft engine production. The man responsible is rather the Federal Minister for Economics. The only agencies competent for the purchase of aircraft for a future German airline are organs of the AG für Luftverkehrsbedarf."

As all aviation people know, the Transport Minister's uncertainty about Mr. Horner's identity is unfounded. H. Mansfield Horner is indeed President of the United Aircraft Corporation, and Pratt & Whitney Aircraft Division—one of the Corporation's four manufacturing divisions—is the biggest aircraft engine works not only in the United States but also in the world.

Be that as it may, this little by-play between "Der Spiegel" and the Transport Minister is not the only contribution to the lively discussion on the "when," "how" and "who" of German air transport among the German public.

Walter Scheel (Free Democratic Party), a member of the North Rhine-Westphalia Parliament, had sharply criticized the Federal Government's aviation policy at a press conference early in June. He had accused the Government of trying, by introducing a Bill for a Federal Air Office, to create an "aviation bureaucracy" and "eliminate private economic and scientific initiative." The Federal Transport Minister had also replied to these attacks in the Bulletin.

What is it all about ?

A report recently received from Germany combining reliable information with objectivity seems worthy of publication here :

German Aviation hoping for Freedom

West Germany still has no aviation, but is busy organizing it. Why it has so far been impossible to keep to any of the dates set for its re-establishment should be well-known : freedom of the air in Germany depends on ratification of the so-called Bonn treaty (peace treaty between the Western allies and Germany), where civil aviation is concerned and of the European Army Treaty (European Defence Community) on the military side. But ratification of these two treaties seems to be further away than ever. Must German air transport sit on the Penitents' Bench for ever ?

The German airline has been more or less prepared on paper by the AG für Luftverkehrsbedarf (Luftag), and the former German aircraft industry has been checking its capacity and efficiency in an attempt to determine what former works could take up production of airframes, engines and equipment again. Admittedly, the question of financing and equipping these factories has not yet been entirely settled, though negotiations for the production of foreign equipment under licence appear to have been opened and in some cases even completed. Germany is also expecting to get her share of NATO or off-shore contracts. In spite of all Germany's past experience and of the existence of a certain production capacity, many German experts think there can be no proper reconstruction in the aircraft industry without licence contracts.

This is one freedom for which German aviation is waiting, namely the external freedom.

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Another freedom in which the public and in particular aviation circles are no less interested is the internal freedom. This is freedom from the conditions described by critics as "aviation bureaucracy."

In brief, the question at issue is the legislative re-organization of German civil aviation, the division of responsibility between Federal and Land Governments on the one hand and between Government and private agencies on the other.

Differences of opinion had already come to light during discussion in Parliament of a new Air Transport Bill and the Bill setting up the Federal Air Traffic Control Institute. The main subject of dispute is the Federal Air Office versus the German Aeronautical Test Institute (DVL).

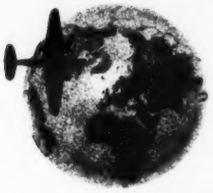
The draft bill to create a Federal Air Office made this authority responsible for all inspection and certification of aircraft, investigation of accidents, etc. Parliamentary transport commissions of both the Bundesrat and the Bundestag on the other hand advocated that the technical inspection of aircraft should not be among the duties of the Federal Air Office. In the unanimous opinion of industrial and scientific circles the privately organized DVL was much more capable of objective judgment on technical questions. It was stressed that the DVL, a non-Nazi organization (it was founded in 1912 and was not dissolved by the Allies after the war), had always proved entirely satisfactory. Admittedly the former DVL premises in Berlin-Adlershof were now occupied by the Headquarters of the People's Police, but the Institute was making every effort, with the help of such Länder as Bavaria, Württemberg and North Rhine-Westphalia, to establish itself in West Germany. The driving force behind these efforts is Professor Seewald of Aachen Technological Institute, former Director and now Chairman of the Board of the DVL.

In spite of all criticism, the Bonn Ministry has continued its efforts to steer the original Bill (described by the German Press as a design for "aviation under Government monopoly") through the rocks of Parliamentary opposition. So far these efforts have failed, and further discussion of the Bill has been postponed by the Bundesrat.

What is the reason for the Federal Transport Ministry's apparent dislike for the DVL ? Purely and simply that for some reason or other the Bonn officials just do not believe that a private German aircraft industry will ever come into being again. Hence the criticism by Deputy Scheel, hence his complaints against a "bureaucracy which is trying to build up an Air Ministry around itself." This is why all those circles in German aviation which have not yet forgotten their experience with the former Reich Air Ministry feel rather uncomfortable about the present situation.

*

This glimpse behind the German civil aviation scene is perhaps all the more interesting since the purchase of flying equipment for the future Deutsche Lufthansa now appears to have been decided upon. Early in July reports were received from both New York and Bonn that the AG für Luftverkehrsbedarf had placed a firm order for a number of Lockheed 1049 *Super Constellations* for delivery in the Spring of 1955 and had taken an option on additional aircraft of the same type. A preliminary agreement for the supply of twin-engined Convair 340's in the Spring of 1954 is also said to have been concluded. This makes it look as if the Deutsche Lufthansa were proposing to open services in Europe in the summer of 1954 and overseas services in the summer of 1955.



What's in the Air ? *

AVIATION POLITICS

● House of Representatives endorses 120-wing plan...

The *120-wing plan* submitted by U.S. Defense Secretary Charles E. Wilson has now been *endorsed by the House of Representatives*. A motion by Democratic Representative George H. Mahon (Texas) to increase the U.S. Air Force vote by $1,175,000,000 was defeated. These decisions suggest that the Congress will accept the *1953-54 defence budget* (up to June 30th, 1954) put forward by the Eisenhower Administration in its entirety.

● ...and in practice

The U.S. Defense Department has cancelled a maintenance contract for more than $3,000,000, which the U.S. Air Force had signed *only the day before* with Pacific Airmotive Corp.—The cancellation was particularly disappointing for the company, as it is only now beginning to recover from losses incurred by the cancellation of Government orders in the first quarter of 1953.

● USA: prohibited area

Pilots of Atlantic airlines flying to the east coast of the United States are now to receive sealed envelopes before take-off, marked "To be opened when airborne." They contain instructions for approach and identification procedures to be followed if the aircraft arrives off-course or off time schedule (instructions for air corridors, altitudes, frequencies for reporting, identification signals, etc.).—The new system, named TOMCIS (Test of the Multiple Cadre Identification System), which has been worked out jointly by the U.S. Air Force and the Royal Canadian Air Force, is designed to save patrol flights, as "doubtful cases" can thus be identified by radar. The instructions, issued by the Defense Department in Washington, are changed daily and communicated to the airlines concerned through the U.S. Embassy in Dublin.

● New French Secretaries of State

Prime Minister Joseph Laniel has completed his Government by the appointment of 17 Secretaries of State, including : Defence, P. de Chevigné ; Navy, Jacques Gavini ; Air, Louis Christiaens ; the new Ministry of Civil Aviation and Public Works has been taken over by Paul Devinat.

● German Defence Commissioner in America

Theodor Blank, West German Defence Commissioner, accompanied by seven of his staff, recently paid a two-weeks' visit to the United States to discuss the following subjects with the American Defence authorities : supplies of American equipment for the German European Army contingents (12 divisions), in particular for the future German air force ; training of German personnel, in particular of German pilots on American jet fighters ; part to be played by the German EDC contingent in the defence of Western Europe.

Robert A. Lovett, U.S. Defense Secretary who retired with the Truman Administration at the beginning of 1953, has been appointed to the *Board of North American Aviation Inc.* Lovett is a member of the New York private banking house of Brown Brothers, Harriman & Co.

Colonel D. Arthur Eschenauer, colleague of Theodor Blank, West German Defence Commissioner, died in Paris on July 14th, 1953, after a brief illness. German delegate for Air Force questions to the European Defence Community in Paris for the past year, Eschenauer was regarded as one of the most gifted officers on Blank's staff. Of incorruptible character, he resisted all temptations of the Nazi period. High NATO officers attended his funeral in Paris.

● U.S. Arms Aid for Japan

The Japanese Government has now agreed to the opening of negotiations on American arms aid, which it had hitherto refused in the fear that Japan would be obliged to provide troops for overseas duties in the event of war. Meanwhile the U.S. Ambassador in Tokyo has stated that the Japanese contingents to be set up with American aid will only be employed for the defence of the Japanese islands.

SERVICE AVIATION

● Changes at NATO headquarters

NATO Headquarters in Paris have announced the following changes in the supreme command of the Allied forces in Europe (following recommendations by the NATO Standing Group in Washington) : *Marshal A. Juin* to be Commander-in-Chief of all Allied forces in Central Europe, with effect from August 1st, 1953 ; *General Lauris Norstad* to be Air Deputy to the Supreme Commander, with effect from August 1st, 1953 ; *Air Chief Marshal Sir Basil Embry* to be Commander-in-Chief, NATO Air Forces, Central Europe (in succession to General Norstad).

Coronation Day : Lord and Lady Douglas of Kirtleside (Chairman of BEA).

● NATO exercise in Greece

NATO air forces from Southern Europe, the U.S. 6th Fleet and units of the U.S. Marines took part in the NATO exercises in Greece at the end of July.

● U.S. aircraft carrier for France

The Senate Armed Services Committee has approved unanimously the loan of the light aircraft carrier USS *Belleau Wood* (11,000 tons), of World War II fame, to France. The *Belleau Wood* has already been de-mothballed in San Francisco in anticipation of Congress approval of the loan, and refitted at a cost of $6,000,000 (arms aid funds). The aircraft carrier is to go to Indochina, where France already has two chartered light carriers, the USS *Langley* (same class as the *Belleau Wood*) and a British light carrier.

● Britain replaces Superfortresses by Canberras

The U.S. Air Force has reported from Washington that Great Britain is returning to the U.S. Air Force 100 Boeing B-29 *Superfortresses* leased under the arms aid agreement. A first unit has already been ferried to Dover (Del.), and the remainder are to follow during the next 18 months, as RAF squadrons are equipped with English Electric *Canberras* in their place.

● Russian offer to West German pilots

Gerhard Mücke, Chairman of the "Ring deutscher Flieger" (association of former German pilots), has told the Frankfurter Zeitung that West German pilots had recently been receiving invitations from official Russian sources to take part in training courses on modern flying equipment in the Eastern Zone of Germany. The "Ring deutscher Flieger," which comprises some 40 local groups, has warned its members not to accept such invitations.

● Royal Netherlands Air Force celebrates 40th birthday

The Royal Netherlands Air Force celebrated its 40th anniversary on July 18th, 1953, with a NATO fly-past at Soesterberg air base.

AIR TRANSPORTATION

● Atlantic weather ships

A *North Atlantic Ocean Station* meeting (chairman, Holland's Air Minister A.P. Dekker), attended by 20 countries with transport interests in the North Atlantic, was held during the ICAO 7th Assembly. Subject discussed : extension of the 1949 agreement on the ten Atlantic weather stations, with a total of 25 weather ships.

* Extracts from INTERAVIA AIR LETTER, daily aviation news digest, in English, French and German. All rights reserved.

Fiat S.A. of Turin has been granted production rights by *North American Aviation Inc.* under the off-shore programme for the F-86B *Sabre* all-weather jet fighter. The U.S. Air Force's first order for Fiat is for roughly 50 aircraft to a total value of $22,500,000. Professor Vittoria Valletta, Chairman of Fiat S.A., signing the licence agreement with J. H. Kindelberger, Chairman of North American, and General Umberto Tolino, representing the Italian Government.

● Charter companies versus scheduled airlines

The quarterly meeting, held in Paris, of the International Federation of Independent Air Transport Operators (delegates from France, Britain, Scandinavia, Spain) showed some concern over a report by its President that a British charter company (Hunting Air Transport) had been refused permission to operate between Newcastle and Scandinavia, as the International Air Transport Association had objected to the low fares it proposed to charge. The authorization originally granted by the British Ministry of Civil Aviation before this intervention had subsequently been withdrawn.—The meeting called for energetic measures to prevent what it termed "threatened dictatorship by IATA."

● Run on Polar routes

During CAB hearings on the extension of American Far East routes, Trans World Airlines Chairman Warren Lee Pierson stated that CAB should authorize a *second round-the-world route* "for reasons of national interest" and permit TWA to operate it. TWA wants to extend its Europe—Far East services to Tokyo, where it would connect up with Northwest Airlines' services to the United States.

Pan American World Airways has asked CAB for authorization for a great circle route across the *Pole from the American West coast to the Far East,* which would shorten PAA's present route (with landings on Hawaii and Wake) by 1000 miles. According to PAA Vice-President Alvin P. Adams, passenger services on the present Tokyo route cost the company—and ultimately the Government—roughly $1,000,000 a year.

Northwest Airlines has applied for a Polar route from *Anchorage to Tokyo,* which (as with PAA) would mean considerable savings (subsidies of $3,785,000 in 1952 on $1,027,285).

● Navigators strike

A strike by Trans World Airlines navigators, which caused the whole of *TWA's Atlantic services to be suspended,* was due to the apprehension by the Navigators Union (a branch of the Transport Workers Union) that TWA will declare all navigators redundant. The question of the need for navigators appears to be approaching solution on a world-wide scale. PAA and KLM for example have already been operating for some time without navigators, whose work is now done by the first and second pilots.

● Italian air transport bill

The Directorate General of Civil Aviation in the Italian Defence Ministry has submitted a *bill to encourage air transport,* calling for the expansion of airports, the construction of twin-engined medium-range turbojet or turboprop aircraft (Piaggio, SIAI-Marchetti, Agusta projects), training of personnel, subsidies for uneconomic routes flown in the public interest, etc. Estimated cost of the programme, to be spread over three years, 30,000,000,000 lire.

● KLM 1952: five million florins

KLM reports a net profit of Fl. 5,700,000 for the 1952 business year, after allowance for taxation. The fall in profits compared with the previous year (Fl. 10,500,000) is attributed to difficulties resulting from the American oil strike and the fact that the seven Douglas DC-6Bs ordered were not delivered until towards the end of the 1952 summer season.

● Screen wall for London's nerves

A sound-proof wall 30 ft. high has been erected at London Airport to screen the noise of aero engines being run up after overhaul. The wall, the first of its kind in Great Britain, is in the shape of a shallow flattened V designed to provide the maximum screening effect.

According to a telephone message from KLM's press service, this picture shows a female passenger who did not like the whipped cream throwing it on the nose of the aircraft—to the Captain's horror . . . (It looks to us like film-star Betty Hutton christening KLM's first Lockheed Super Constellation.)

INDUSTRY

● DC-7 orders total $100,000,000

Delta-C. & S. Air Lines (Delta and Chicago & Southern recently merged) has ordered six Douglas DC-7s, bringing the total orders held by Douglas Aircraft Co. for this type up to 64, with a total value of $100,000,000.

● Kaiser-Frazer dismisses 7,600

Kaiser-Frazer has been obliged to dismiss 7,600 workers following the cancellation of U.S. Air Force orders for 159 Fairchild C-119 Packets and 244 Chase C-123s which were to have been built at the company's Willow Run (Mich.) plant. When the last eleven C-119s now being completed under contract are delivered in mid-August it is expected that another 3,000 workers will be laid off.

● P & W T-34 propeller turbine released for civilian use

Pratt & Whitney Aircraft Division of United Aircraft Corp. is now offering, with U.S. Navy approval, a civil version (PT2F-1) of its T-34 propeller turbine for sale both at home and abroad. This engine, of Pratt & Whitney's own design, may be regarded as the most powerful propeller turbine ever made available for commercial aircraft (5,600 e.s.h.p.).

● USIA administration

The General Meeting of the Union Syndicale des Industries Aéronautiques (French Aircraft Manufacturing Association) re-elected the Board as follows : Chairman, Maurice Heurteux (Managing Director of Hispano-Suiza) ; Vice-Chairman, Marcel Dassault (Société des Avions Marcel Dassault) ; Henri Desbruères (SNECMA) ; Jacques Piette (SNCA du Nord) ; Georges Glasser (SNCA du Sud-Ouest) ; Treasurer, Paul Grimault ; Secretary, André Granet.

● First European JATO rockets

Representatives from ten countries attended demonstrations of take-offs with JATO rockets (jet assisted take-off) at Tivoli near Rome. These rockets are to be built under licence by *Compagnia Generale Italjet* under the off-shore programme.

● Dutch-Belgian cooperation

After lengthy negotiations Holland and Belgian have now agreed on the joint production of 474 Hawker *Hunter* jet fighters to be provided under the off-shore programme. Holland (Fokker) is to provide the airframes, while the Belgian firm of Fabrique Nationale d'Armes de Guerre is to take over production of power plant and undercarriages. The United States is to provide 2,100,000,000 Belgian francs towards the total of 5,850,000,000 francs involved. Belgium is to get four-sevenths of the former sum and Holland three-sevenths. The Belgian Ministry of Finance has also granted the companies concerned a special credit for the purchase of tools and machinery for undercarriage production.

Aviation Section at the Turin Exhibition

The *Third International Technics Exhibition,* to be held in Turin from September 30th to October 11th, 1953, will include an *Aviation Section* for the first time. No actual aircraft will be shown, but emphasis will be on *parts and accessories* from a number of European countries (engines, turbojets, turboprops, instruments, electronic equipment, photographic equipment, etc.). Exhibitors will include the Italian Air Ministry, the Italian Aircraft Industries Association and leading airlines. *Organizing Committee :* Turin.

Why did the Comet crash?

The Indian Report on the Calcutta Accident

" Structural failure of the airframe during flight through a thundersquall " probably caused the crash of the de Havilland *Comet I* jet airliner of British Overseas Airways Corporation near Calcutta on May 2nd, states the report issued by the Indian Court of Inquiry released in London by the British Ministry of Civil Aviation on June 15th. Since this was the first fatal crash—with 43 casualties—of a jet-propelled commercial air transport in scheduled operation, the report, which was compiled and made public in the commendable record time of just over six weeks, deserves being studied in some detail . . . all the more so because the Indian enquiry is one link in the chain of investigations that will be completed by the final British report now being elaborated at Farnborough. It should be pointed out emphatically that the Indian report openly admits that the " reconstruction " of the accident made during the enquiry was necessarily based partly on assumption and therefore must be regarded as " circumstantial evidence ". The qualified, expert eyewitnesses of the accident lost their lives in it.

The investigation of the accident was conducted by a special Court of Inquiry under the chairmanship of N. S. Lukor, who was assisted by three assessors : K. M. Raha, Deputy Director-General of Civil Aviation in India ; N. Srinivasan, of the Design Department, Hindustan Aircraft Ltd. ; and T. R. Nelson, Senior Inspector of Accidents, British Ministry of Civil Aviation. Their investigations were supported by 31 witnesses, including nine Britons and 22 Indians. Investigations proceeded from May 4th to May 14th, when the Court of Inquiry convened, as well as later on. The public hearings were concluded on May 23rd. Representatives of B.O.A.C. were present throughout the hearings and were allowed to assist the Court by suggesting questions to be put to witnesses, either to elicit further information or to elucidate any statement already made. The report now presented is the product of collaboration between the Chairman of the Court, N. S. Lukor, and his three assessors, who were unanimous in their findings.

The aircraft involved was the de Havilland D.H. 106 *Comet* Series I 06008, registered as G-ALYV. Delivered to B.O.A.C. early in 1952, it had a Certificate of Airworthiness valid until April 21st, 1954, and a total flying time of 1,623 hours at the time it left London Airport on April 30th, 1953. Several engine changes had been made since the time of delivery. The report mentions four separate regular impeller modifications, as well as a fractured impeller and an " unserviceable " impeller during its flying career.

The pilot, Captain Maurice William Haddon, was an experienced airman aged 37, who had logged 8,710 hours as a pilot and 27 hours as a navigator, including 589 hours as a pilot on the *Comet*. He was familiar with flying conditions at Calcutta, since prior to 1953 he had flown other aircraft types on the India routes for British Overseas Airways Corporation.

The accident occurred during the scheduled return flight of the jetliner on B.O.A.C.'s regular London-Singapore service. The aircraft took off from Calcutta Airport, Dum Dum, at 10 : 59 hrs. GMT (16 : 29 hrs. IST) on May 2nd, on its way to Pala Airport, Delhi. The take-off was normal. Yet, six minutes after take-off radio communication contact with the aircraft was lost. At about that time some cultivators living in the adjacent villages of Jagalgori, Chanashampur, Radhanagar and Mahisnan, at distances varying from 24 to 30 miles from Dum Dum Airport, saw the aircraft coming down in a blaze of fire through a severe thunderstorm and rain. It finally crashed into a ravine soon after 11 : 05 hours GMT (16 : 35 hrs. IST), and continued to burn for some time. The 37 passengers and six crew members were killed (40 bodies were subsequently recovered). At 14 : 45 hrs. GMT (20 : 05 hrs. IST) the Inspector of Accidents, Civil Aviation Department, New Delhi, was notified that the aircraft was overdue, and at 0400 hrs. GMT (09 : 30 hrs. IST) of the following day, May 3rd, he was informed that the wreckage had been located. On May 4th at 09 : 30 hrs. GMT (15 : 00 hrs. IST) the Inspector of Accidents, New Delhi, accompanied by a Senior Inspector of Accidents from the Ministry of Civil Aviation in London, arrived at the scene of the disaster.

What had happened ?

The Court of Inquiry admits quite frankly that in spite of the ability and technical knowledge of the assessors, it was found difficult to arrive at a definite and certain conclusion regarding the cause of the disaster. " All we could do was to suggest the probable causes . . "

A well-substantiated theory on the probable cause of the crash is put forward in an appendix to the report by *N. Srinivasan*, of Hindustan Aircraft. An extract from his theory follows :—

A technical examination of the wreckage has supplied several significant features indicating structural failure during flight. Fire was a subsequent occurrence and spread from the wing tanks on to the main body of the airplane. A study of the different components and the nature of the failures strongly suggests *primary failure of the elevator spar in bending due to a heavy down-load imposed in a pull-up by the pilot* when the aircraft encountered a sudden down-gust during its flight across a ' nor'wester ' squall.

During flight in a down-gust, the aircraft not only loses altitude, but it takes a nose-down attitude. The air speed increases. The pilot immediately reacts to maintain the attitude of the aircraft by a pull-up, and the co-pilot throttles back the engines for reducing the speed to keep it within the specified limits.

The wreckage reveals that all the four throttle controls were in the half-open position. The aircraft had responded to the corrective action taken, but a sudden elevator failure must have imposed a heavy load on the wings, with the resulting failure of the wings at about rib No. 7 on both sides ; the elevator failure in addition provoked a failure of the rear part of the fuselage.

The aircraft, with only stub wings and no tail unit, but complete with its four engines, may have gone into some type of spin during its fall ; it settled into the ravine in an inverted position. The passengers appear to have been subjected to high positive " G " loads during the pull-up and even higher negative " G " on elevator failure.

It is understood that during the development stage of the aircraft the wing was subjected to a static test by the manufacturing firm. On one test piece static and fatigue tests were conducted alternately. The wing failed in fatigue test and after modification was subjected to another static test. The wing failed again at 90 percent of the ultimate load. The failure was attributed to the fatigue test conducted before. Modifications were carried out again and, without a re-test, the wing was found satisfactory for the ultimate load on theoretical considerations. The fatigue failure during static test occurred at rib No. 7 where the cross section changes from two heavy spars to an outboard shell construction.

In this accident, the wings significantly again failed at rib No. 7. Whatever the load may have been, the failure at rib No. 7 may indicate a lack of proper diffusion of the wing loads on to the two spars at rib No. 7. In the absence of design data, no definite comments can be made on the wing failure, but a further investigation on the above subject of load transfer at rib No. 7 will be helpful.

As regards the suggested primary failure of the elevator during a pull-up, the *Comet* has an *elevator control system operated with booster power with no feed-back arrangement for pilot feel.* It is quite probable that the pilot, who is accustomed to a sort of feel on the control during manœuvres, had overcontrolled the aircraft in the squall

beyond the limit that would impose the design loads on the aircraft. In this respect any modification to incorporate a control ' feed-back ' in the elevator system would be a definite improvement.

*

N. Srinivasan's " reconstruction " admittedly is theoretical, but nevertheless it is *based on a number of concrete technical facts* which emerged during the inspection of the wreckage. These are :

(1) At the time of the crash, undercarriage and flaps were fully retracted.

(2) The four throttle levers were broken and jammed in the ' half-open ' position.

(3) High-pressure and low-pressure fuel cocks were ' on '.

(4) Elevator and aileron trim settings were about normal. Rudder trim could not be determined.

(5) The cabin was being pressurized.

(6) The fire extinguishers had not been operated, nor was there any evidence of any emergency procedure having been taken.

(7) Both the extension wings had failed under a down-load at a station outboard of rib No. 7.

(8) The tailplane had suffered extensive impact damage, probably by wing panels detaching themselves.

(9) The elevator spar showed bending failure under a down-load ; the mass balance appears to have detached itself. There was no evidence of impact damage at the point of bending failure of the elevator spar.

(10) The fuselage had failed at frame No. 26 close to the attachment station of the fuselage to the wing centre section. The rear fuselage had been affected by fire in the cabin portion.

The Court's Conclusions

Since examination of the wreckage on the site of the disaster revealed no sign of sabotage, lightning damage, faulty workmanship, defective material, or power plant failure, the Court of Inquiry comes to the following conclusions :

The aircraft encountered a nor'wester squall with thunderstorm shortly after take-off when climbing to its cruising altitude and suffered structural failure in the air which caused fire.

The structural failure was due to overstressing which resulted from either :—

(1) *severe gusts encountered in the thundersquall,* or

(2) *overcontrolling or loss of control by the pilot when flying through the thunderstorm.*

Recommendations

In view of what transpired in the course of the enquiry concerning wing failures in the vicinity of rib No. 7 and the absence of control feel feed-back to the pilot, the Court recommends :

(1) *That the wreckage be transported to the United Kingdom and its detailed technical examination be undertaken with a view to determining the primary failure (elevator) and to consider if any modification in the structure (wing) of the* Comet *aircraft is necessary ; and*

(2) *That consideration be given to the desirability of modifying the flying control system of the* Comet *in order to give the pilot a positive ' feel ' of air loads exerted on the control surfaces.*

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As regards recommendation (1), the wreckage arrived in England several weeks ago, and a detailed investigation and design study is now under way at the Royal Aircraft Establishment, Farnborough. According to the latest reports, the study is expected to last several months.

As regards recommendation (2), the problem of control feel was raised in the minds of a wide aeronautical public by the non-fatal B.O.A.C. *Comet* crash at Rome-Ciampino in October 1952, when pilot error (overcontrolling on take-off) was blamed for the mishap. It was again raised after the fatal crash at Karachi in March of a *Comet 1A* being delivered to C.P.A.L., when speculation once more centered on the aircraft's fully power-operated controls. The Indian report, on the other hand, mentions two additional incidents involving the same type of aircraft : it discloses that on June 8th of last year the ill-fated G-ALYV undershot on landing at Beirut, as a result of which the starboard outer, centre and inner flaps were damaged by the airport boundary fence. Finally, it reveals that Captain Haddon, of the G-ALYV on its last flight, an experienced pilot with well over 8,000 hours flying time, who in 1944 had been commended for " exceptional airmanship ", was admonished for landing *Comet* G-ALYU heavily at Khartoum airport on April 23rd, 1952, causing slight damage to the aircraft.

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That the makers of the aircraft were not very enthusiastic about the implications of the report is evident from the joint statement issued by *The de Havilland Aircraft Co. Ltd. and B.O.A.C.* on June 15th. It said : " It is not possible, until the detailed examination of the aircraft wreckage now under way has been completed at the Royal Aircraft Establishment, to determine the sequence of structural failure. Until such a sequence is determined it is only possible to theorize on the cause of the accident . . . " — Which the Indian report does not contest.

The Development of International Performance Standards for Commercial Aircraft

by Dipl. Ing. A. MÜNCH, I. C. A. O., Montreal

Safety and Economy

As the take-off, climbing and landing performance of aircraft depend very closely on gross weight under given conditions, safety standards concerned with uniform definition of permissible gross weight or payload based on performance are of decisive effect on the operating economy of commercial aircraft. It is therefore important that such standards should provide, for every individual flight, a sound balance between safety and economy.

Purchase price and operating costs of modern airliners are so high that the latter requirement is now urgent, and it became obvious a few years ago that *existing standards* would have to be *revised.*

The International Civil Aviation Organization has held conferences at regular intervals since 1949 at which performance experts from aviation authorities, the International Air Transport Association and the International Federation of Air Line Pilots Associations have discussed the revision of the present international performance standards. This work is now almost completed, and its results have aroused lively interest in international air transport circles where safety and economy are of prime importance. The following is a general survey of the evolution of the technical bases for international safety standards up to the recent proposals for revision.

Original standards

The first international standards dealing with performance formed part of the air-

worthiness rules issued before the war by the International Commission for Air Navigation. In those days a commercial aircraft was required to have a take-off run at sea level and in standard atmosphere conditions of less than 600 metres and a landing run of less than 300 metres. It was also required to be capable of climbing to 320 metres within three minutes with maximum permissible gross weight.

Most of the public aerodromes were big enough for the aircraft which answered these requirements : the Fokker F VII, Handley Page *Hannibal*, Junkers Ju 52 etc. It was therefore more or less taken for granted that an airworthy aircraft would be able to take off and land safely at any aerodrome that was open to general air traffic. In critical conditions operating suitability and permissible gross weight were decided on the basis of test flights or general flying experience. Any closer relationship between performance and aerodrome or route conditions was scarcely possible in those days, since in the majority of cases there were no adequate data to go on. As regards performance, the safety of an aircraft therefore generally depended on a purely "qualitative" assessment of conditions by the pilot or the traffic control officer. As long as flying was done only with ground visibility and by day, an engine failure was not regarded as anything very serious, especially as landing speeds and dimensions of pre-war aircraft were still small enough for an emergency landing to be regarded as an acceptable risk. Nevertheless, as time went on, multi-engined aircraft were required to be able to continue flight between 0 and 1000 m without loss of height even if one engine failed. Observance of this standard ensured relatively safe flight under instrument flying conditions and at night, as well as over large water surfaces and longer continental routes where forced landings could not be made with safety.

However, the I.C.A.N. performance standards were no longer adequate when bigger, faster airliners, designed for economy and long range, such as the DC-4, DC-6, *Constellation* and Boeing 377, made their appearance. Higher cruising speeds meant higher take-off and landing speeds, and these in turn led to take-off and landing runs which greatly exceeded the I.C.A.N. limits.

The demand for greater operating economy resulted in increases in payload at the expense of rate of climb reserves. Take-off flight paths became flatter and flatter and hence necessitated the removal of obstructions over a greater and greater length of the approach and departure routes.

Modifying existing aerodromes for longer take-off runs, flatter flight paths and higher wheel pressures was a complicated business, and in many cases economic or constructional difficulties have prevented such requirements from being met in full. It therefore became essential, for the certification of modern aircraft, fully airworthy in themselves, to create standards for certain routes that will permit of a technical assessment of the relationship between performance and gross weight on the one hand, and between airport and route conditions on the other.

First I.C.A.O. performance standards

National performance standards were put into force for the first time in the United States—which did not belong to I.C.A.N.—rather more than ten years ago, for the new generation of commercial aircraft then taking shape (DC-4, DC-6, *Constellation*, Boeing 377). These standards were put forward for international use in 1944 at the Chicago International Civil Aviation Conference. After careful checking by I.C.A.O., the American performance rules were accepted without major amendments as international standards in 1949.

The present I.C.A.O. airworthiness standards distinguish between two airworthiness categories for commercial aircraft : Category A and Category D. *Category A aircraft* must be able to continue flight and land at a suitable airfield even if one engine fails. They are therefore *always multi-engined types* and comprise above all the large commercial aircraft (DC-6, *Constellation*, Boeing 377) used in regular air transportation. —*Category D aircraft*—namely aircraft which have not sufficient engine power after failure of one engine to fly to a suitable airfield—are as a rule *single-engined models*, are of limited size and have relatively low landing speeds. Their operation on transport routes over large water surfaces or in instrument flying conditions and at night is no longer permitted. The use of Category D aircraft (for example the de Havilland *Beaver)* is therefore limited in general to short-distance charter traffic. Finally, standards for another category of aircraft, to be known as Category C, are in preparation. These are multi-engined airliners, whose performance en route corresponds largely to that of category A aircraft, but which cannot always continue flight if one engine fails during take-off.

The I.C.A.O. standards for these categories are divided into two main groups. The first comprises *airworthiness standards*, which are of interest primarily to the manufacturer ; the second, *operation limitations*, for the observance of which the operator or pilot is responsible. The two groups complement each other.

The *airworthiness standards* lay down *minimum climb performances* for each phase of flight (take-off, en route flight, landing), which the aircraft type must attain under normal operating conditions. They were based on operating experience with proven aircraft types of high safety and economy. In particular the qualities of the Douglas DC-3 were used as a base.

The airworthiness standards also contain rules for determining the performance required for safe take-off and en route flying, i.e., for a baulked landing run in the event of an engine failure, take-off and landing runs, climb performance in the various phases of flight etc.

In these standards each performance is based on a definite " *operating case* " : speed, engine power, flap setting, propeller pitch, undercarriage position etc. The prescribed conditions correspond to those which experience of traditional commercial types has shown to be the most suitable.

For the given operating cases performance must first be determined for characteristic basic conditions, e.g. maximum permissible gross weight, standard atmosphere, no wind and smooth, hard, dry runway surface. Then performance must be calculated for operating conditions that differ from the basic conditions. This is generally done by adapting the results of measuring flights to the operating conditions described in the standards. These performances are entered in the aircraft's Flight Manual, officially checked, and then form part of the certificate of airworthiness. The Flight Manual is issued separately for each individual aircraft and must always be carried in the aircraft.

The *operating limitations*, in so far as they concern performance, govern the relationship which must exist, for safety reasons, between the performance shown in the Flight Manual and practical conditions at airport and en route. For example, they prescribe a *certain leeway* between baulked take-off, take-off and landing runs on the one hand and the dimensions of the airfield on the other. They also define the clearance between obstructions and flight path curves and contain criteria for determining minimum altitudes and the rate of climb reserves required in given cases. To meet these requirements in critical cases, the pilot must alter his gross weight or time of take-off.

The degree of safety provided by these standards is generally regarded as adequate, and accidents due to insufficient performance are now very rare in airworthy aircraft.

*

When the first I.C.A.O. performance standards came into force in 1949, it was realized that, in spite of all efforts, they still contained a number of weaknesses which would have to be corrected in due course. For one thing, the standards were based on experience of older aircraft types and they were therefore not necessarily directly applicable to new or future aircraft. Another weakness was that the degree of safety aimed at could only be assessed qualitatively.

These shortcomings, together with the fact that new " families " of commercial aircraft *(Comet, Viscount, Britannia)* were appearing even when the first I.C.A.O. performance standards came into force, led certain I.C.A.O. countries to seek new performance standards that would be more readily applicable in the future.

The development of new I.C.A.O. standards

As early as the third session of I.C.A.O.'s Airworthiness Division in 1949, Britain laid a general proposal for new performance standards before the other I.C.A.O. members. These standards promised virtually optimum adaptation of performance to airport and route requirements and the definition of a uniform degree of safety that could be expressed quantitatively. The proposal was so promising that I.C.A.O. decided to

instruct performance experts (aviation authorities in a number of I.C.A.O. countries, I.A.T.A. and I.F.A.L.P.A.) to use it as a basis in working out a new set of international standards. These experts produced draft standards which have already been put into operation experimentally, and it is expected that a final proposal will shortly be placed before all I.C.A.O. member states.

*

If the results of a number of similar performance tests are reduced to a *mean value*, the latter gives a first approximation of the performance of the test aircraft at a given moment. However, it gives no indication of the *magnitude and frequency of possible deviations* from the mean value. In general, deviations are so great that they cannot be ignored.

By using *statistical methods*, however, it is possible to show performance in a so-called *performance distribution diagram*—rather than as a mean value—that indicates relative magnitude and relative frequency of deviations from the mean value.

Results of flight tests can be so classified that they each fall into a given magnitude range. If these ranges are entered on the base line of the diagram, and the relative frequency of the performance results on the ordinates, every " class " of performance results can be represented in the form of a rectangle, the width of which corresponds to the performance range and the height to the relative frequency of the results within the performance range in question.

Fig. 1 shows the diagram of performance L of a series of tests whose mean value was designated L_m. The larger the number of flights and the smaller the performance range selected the sooner the stepped curve will approach a smooth curve (cf. broken line, fig. 1).

The performance diagram

When preparing a performance distribution diagram from the individual results of a series of flights, the operating conditions under which the various flights are made are immaterial. In extreme cases series of flights can be used in which aircraft type, pilot technique and route conditions vary from flight to flight. Needless to say the width of the curve (deviations from the mean value) for such an unlimited flight series would be extremely large, i.e. the curve would show practically nothing about the performance of a given aircraft under given route conditions. However, if a performance diagram is made of the results of a series of flights by aircraft of the same type, under similar aircraft conditions and with crews trained on the same principle, the deviations from the mean value will be much smaller.

This process can be continued by fixing other variable test conditions—gross weight, altitude, outside temperature, wind force. Once a curve has been made for a given set of test conditions, its form will not alter for other values of these conditions. On the other hand the mean value performance will vary. Factors influencing the form of the distribution diagram are known as " *statistical variables* ", and those which merely alter the mean value as " *operational parameters* ".

When producing performance distribution diagrams for performance standards, all variables which can be checked for a given operation (aeroplane configuration, gross weight, outside temperature, altitude, state of runway, wind conditions, etc.) will be treated as operational parameters. Statistical variables are the factors which cannot, for practical reasons, be determined before every flight (deviation from the normal engine power and from normal boost pressure, variations in aeroplane configuration, engine speed, flying speed, turbulence, gross weight, outside temperature, atmospheric pressure).

In practice it would scarcely be possible to make sufficient test flights in every aircraft type to give balanced performance diagrams. Investigations have shown, however, that the performance distribution curves for the *statistical* variables in question begin to take on the form of a Gauss distribution curve. Mathematically the Gauss curve can be expressed by an equation : it is bell-shaped and grouped symmetrically about a vertical axis through the mean performance value. The width (or dispersion) of the curve is given by the so-called *deviation standard ;* the area enclosed by the curve and the base line corresponds to the total number of test flights. Once the deviation standard is known, the distribution curve can be constructed. The deviation standard depends on the performance mean value, on the deviations of the individual results from the mean value and on the number of flights. It can be found with sufficient accuracy from a relatively small number of flights, or can be obtained mathematically from the deviation standards of the various statistical variables —on which performance depends.

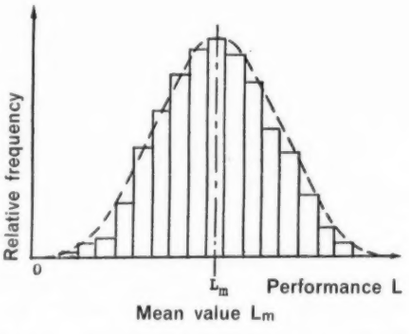

Fig. 1 : Statistical distribution diagram for a given flight performance.

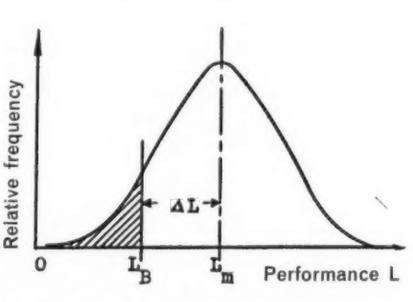

Fig. 2 : Diagram showing relative frequency of cases where performance falls below a given reference performance L_B.

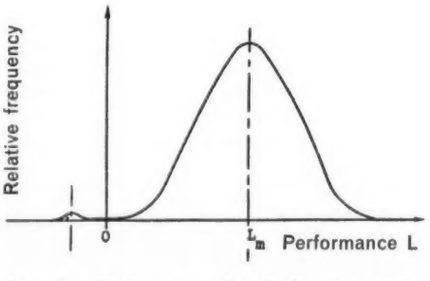

Fig. 3 : Performance distribution for engine inoperative (left) and for engine operative (right) in a single-engined aircraft.

Gauss distribution curves also give the relative frequency of incidents (e.g. performance) which deviate from the mean value by more than a given amount. Thus the hatched area in *fig. 2* represents the probable number of cases in which " obtainable performance " L differs by more than ΔL from mean performance L_m.

The performance distribution diagram thus becomes a useful instrument for determining the relative frequency with which the " obtainable performance " deviates under given operating conditions by more than a given amount from the mean value—or is lower than a given performance. It is also possible to fix in advance an acceptable frequency for deviations from a given minimum performance and calculate the aircraft's mean value performance to correspond. *The quantitative determination of performance requirements in the draft of the new I.C.A.O. standards is based on this practice.* The mean value performance for an aircraft—for given values of the operating parameters and in given flight sectors—is set at such a figure that performance should not fall below a given datum performance more frequently than can be accepted from the safety point of view.

To arrive at the mean value performances required for airworthiness reasons, we must first be clear about the values of the reference performances and the acceptable incident rate. If reference performances (L_B) and incident rate are taken as fixed in advance, the difference (ΔL) between the required mean value performance (L_m) and the assumed reference performance can be obtained from performance distribution diagrams : The required mean value performance is equal to the sum of reference performance (L_B) and so-called margin performance (ΔL).

Nothing has been said so far about loss in performance due to engine failure. If this eventuality is to be included, new methods must be found, as the Gauss curve can only represent flights in which the number of engines is one of the operating conditions. For a *single-engined* aircraft performance distribution can be shown in a diagram similar to *fig. 3* : the area of the large bell

curve corresponds to the total number of flights (of one series) in which the engine functioned ; the area of the small bell curve represents the total number of flights in which the engine was inoperative. Appropriate diagrams can be made for multi-engined aircraft (cf. *figs. 4 and 5*).

Reference performance

A commercial aircraft is regarded as airworthy only if under normal operating conditions (standard atmosphere, no wind, small obstructions etc.) it is capable *at any time* at least of flying on a level course from take-off aerodrome to landing base, the latter having no limits as to dimensions. Although in theory no climbing performance is needed for straight-line flying, any change in course requires turning performance, which corresponds to a *low climbing performance.*

A reference performance which did not allow for any climbing would be inadequate in practice for the phases of flight near the ground. For example, a small positive angle of climb will be required for take-off, as the aircraft should reach a given operating altitude in a reasonable time, even under emergency conditions. These two considerations must be taken into account when fixing the reference performance.

Acceptable incident rate

The top portion of *fig. 6* shows a series of similar curves representing the performance distribution about the mean value for a given flight phase performance (without allowance for engine failure) for aircraft types A, B, C, etc. If the totals curve is drawn for each individual distribution curve, we get the lower family of curves in fig. 6. The ordinate of a point on the totals curve corresponds to the probable number of cases in which a given aircraft fails to reach the appropriate performance per flight (for the same abscissa value).

Assuming L_B to be the reference performance selected, the points corresponding to it on the totals curve give on the ordinate the probable number of cases per flight in which performance of the aircraft type in the flight phase under consideration falls below the reference performance. These totals curves for the distribution diagrams are also drawn in figs. 4 and 5.

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What therefore has to be done in establishing the new performance standards is to find an acceptable value for this incident rate that can be applied to all commercial aircraft, and thus to fix a numerical performance safety level for airliners.

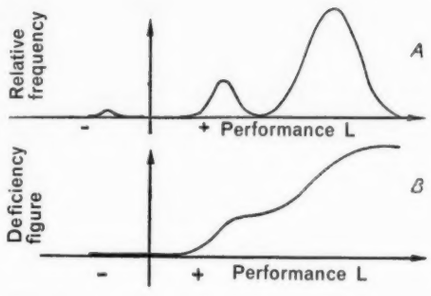

Fig. 4 : Performance distribution with failure of both engines (left), failure of one engine (centre) and with both engines running (right) in a twin-engined aircraft. Deficiency figure (B) is entered as a totals curve below performance distribution (A).

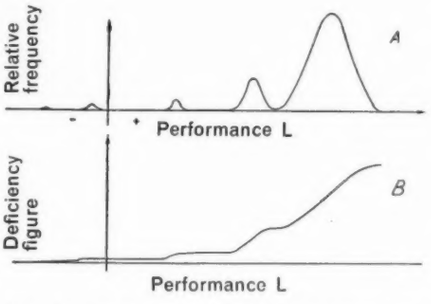

Fig. 5 : Performance distribution for three and four engine failures (left), two engine failures (right, inside), one engine failure (right, centre) and for all four engines operative (right, outside) for a four-engined aircraft. Deficiency figure (B) is entered as a totals curve under performance distribution (A).

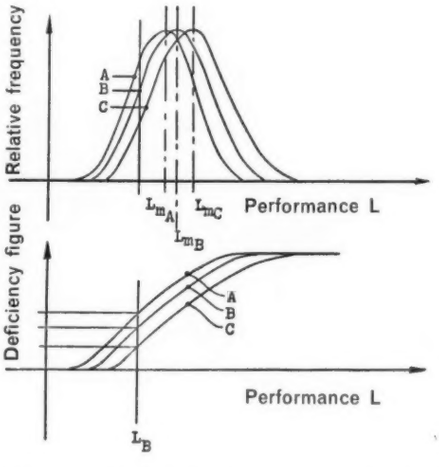

Fig. 6 : Performance distribution (without engine failure) for three aircraft types A, B and C (top) with relevant deficiency value (bottom).

It would be useful to start from the number of cases in present-day air transport where performance falls undesirably short, for example because of engine failure. *Statistics on engine failures,* in world air transportation over a number of years are available, and the draft standards were based on a mean number of engine failures for all types of piston engines. There are, however, other means of determining the acceptable incident rate more precisely, but these will not be described here.

The incident rate per flight (risk unit) at present regarded as acceptable lies between 10^{-5} and 10^{-6}. In other words, *one case of inadequate performance per 100,000 or 1,000,000 flights* is today regarded as an acceptable risk. In practical air transport, however, the risk would be much smaller, as the above-mentioned incident rate is based on the " conservative " assumption that critical conditions affecting performance occur in at least one phase of every flight.

Statistics appear to show that the probability of engine failure increases with the duration of the flight. The likelihood of an engine breakdown is smaller on a short-distance flight than on a long-distance flight. This fact has led to draft standards which limit the use of twin-engined aircraft to relatively short non-stop runs.

Even with today's reliable engines and on short runs, single-engined aircraft cannot reach the acceptable incident rate. However, as a falling off in performance does not necessarily lead to accidents—e.g. when an emergency landing can be made without danger—the safety level for operations by single-engined or low-performance aircraft of category D need not be lower than that for multi-engined aircraft. Nevertheless, it must be insisted that the greater likelihood of deficient performance in such aircraft be compensated by a high degree of safety in emergency landings, in particular by a restriction on minimum speed and gross weight.

*

The above is an attempt to outline the reasons why it appears possible to create *performance standards for a numerical safety degree.* Basically these standards should be applicable not only to traditional airliners but also to the new ones now under development.

Rectification :

In our issue No. 7 on European Research we published on page 397 a stria photograph of a NACA 0012-1.1-30 aerofoil (picture taken by the Aerodynamic Division of the Federal Institute of Technology, Zurich) showing shock waves and break-away of boundary layer in high subsonic flow. The Mach number given should be *Mach 0.87* (not Mach 0.8).

Photo credits :

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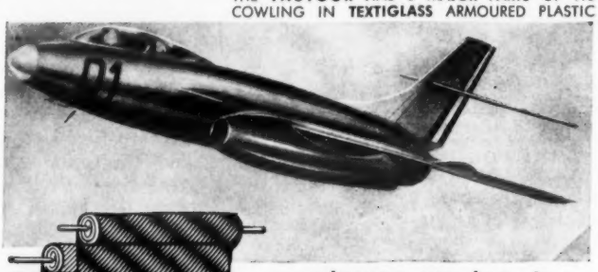

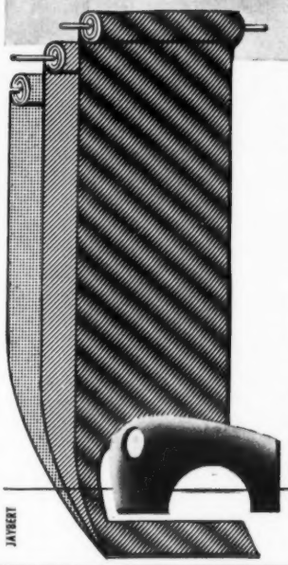

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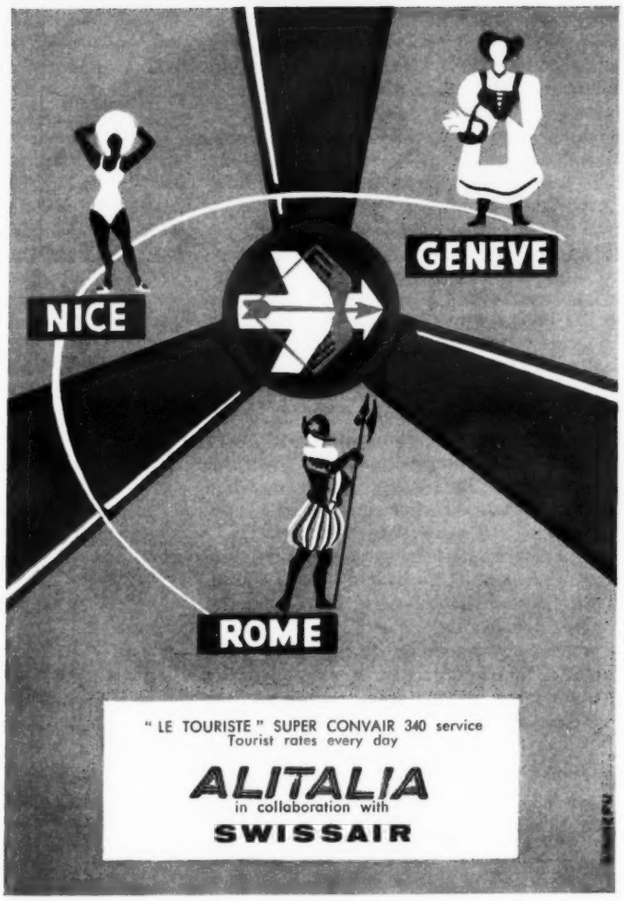

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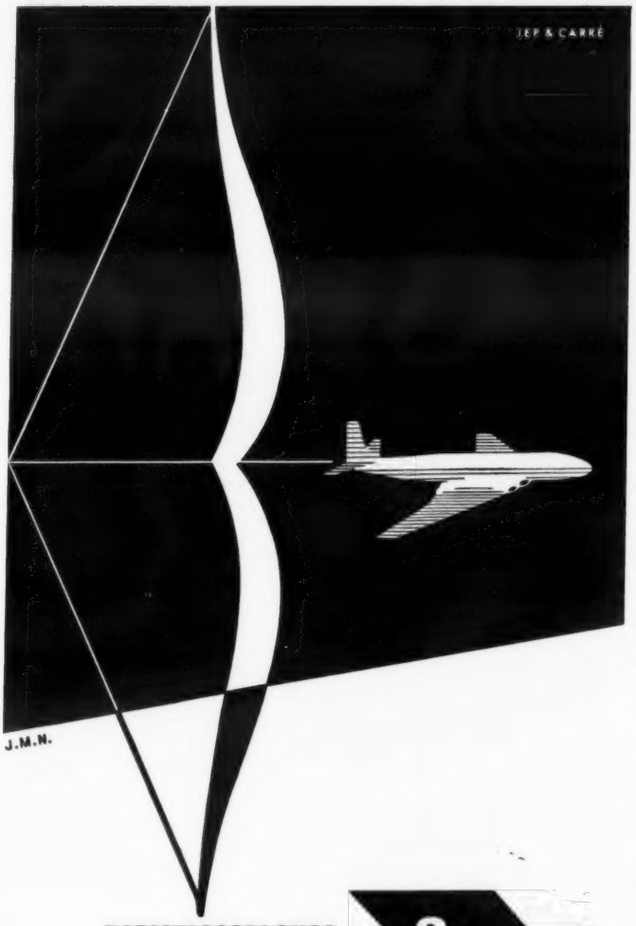

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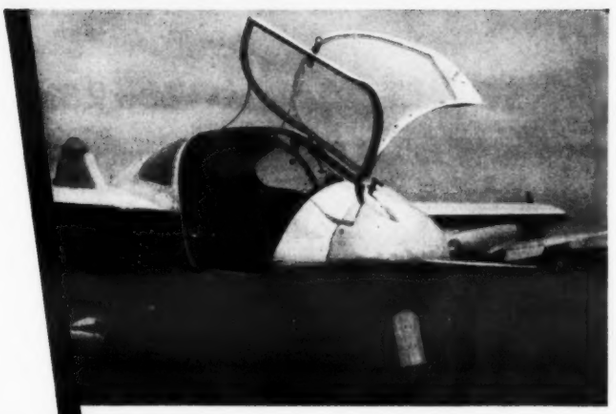

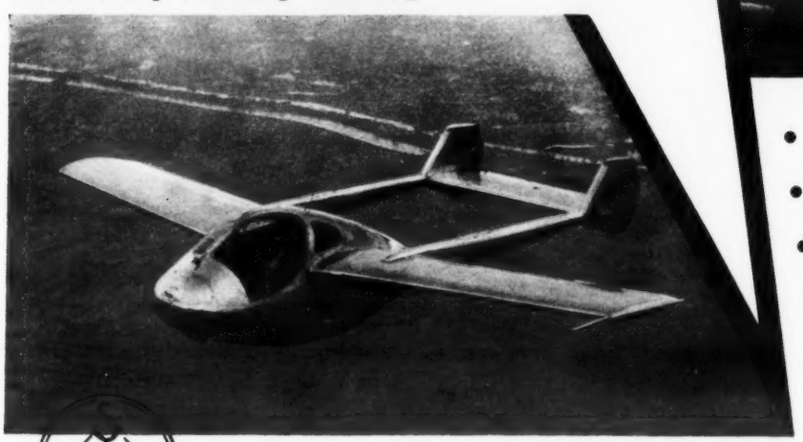

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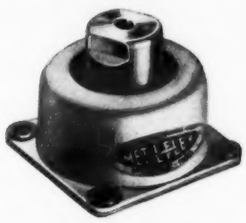

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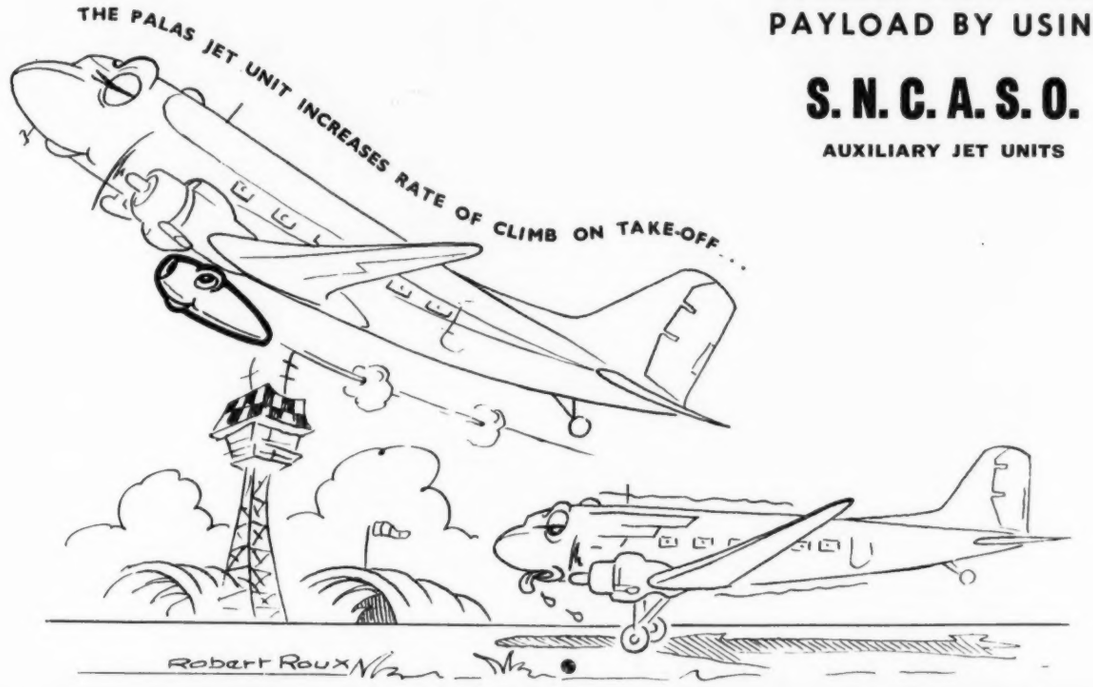

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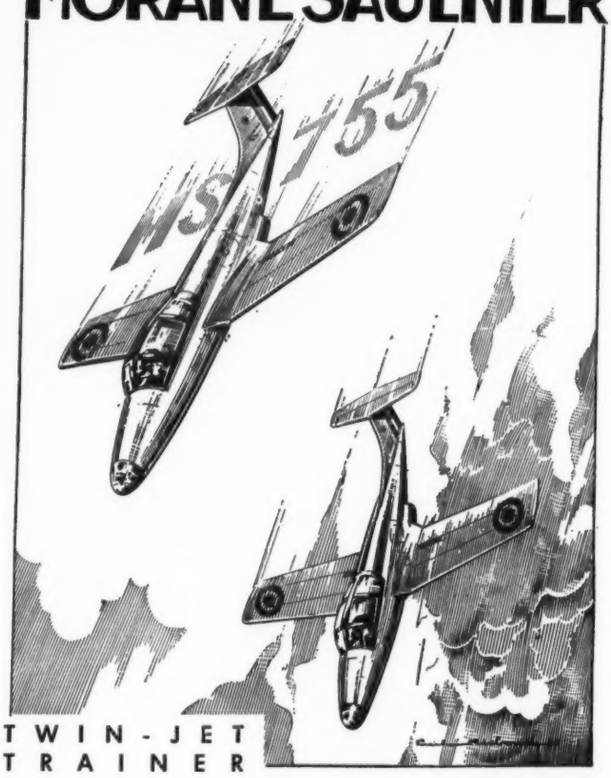

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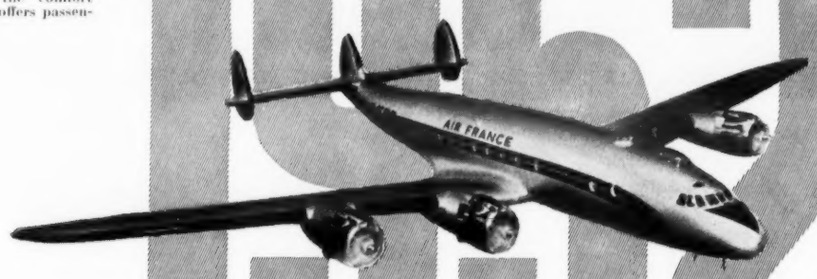
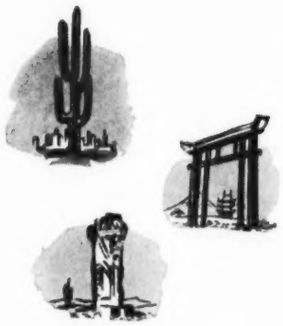


A constructive year, as the following facts show



The opening of several new routes brought Air France's network up to 250,000 kilometres.

APRIL :	Opening of the Paris-Mexico City service.
NOVEMBER :	Paris-Tokyo in 37 hours 30 minutes flying time by "Constellation".
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